BLOOD STREAM INFCTIONS IN ICUs AND THEIR ASSOCIATION WITH CENTRAL VENOUS CATHETERS

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Dedicated

to

My daughter

(Yoana Singla),

My Husband

(Dr. Saurav Singla)

&

My father

(Late Sh M.l. Gupta)

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Dr. Shivani Gupta

ABBREVIATIONS

AMK	Amikacin
AMC	Amoxicillin/clavulanic acid
AMP	Ampicillin
AST	Antibiotic susceptibility testing
ATCC	American Type Culture Collection
BYLC	Budding yeast like cells
CAD	Coronary artery disease
CAZ	Ceftazidime
CEP	Cephalothin
CDC	Centre for Disease Control
COPD	Chronic obstructive pulmonary disease
COT	Cotrimoxazole
CRE	Carbapenem resistant Enterobacteriaceae
CSL	Cefoperazonesulbactam
CTR	Ceftriaxone
CVA	Cerebrovascular accident
CXM	Cefixime
DM	Diabetes mellitus
E.coli	*Escherichia coli*
ESBL	Extended spectrum ß lactamases
ERT	Ertapenem
FOS	Fosfomycin
GHL	Gentamicin high level
GNB	Gram negative bacilli
HAI	Health Care Associated Infections
ICUs	Intensive care units
IMP	Imipenem
LZ	Linezolid

MBL	Metallo ß lactamases
MDR	Multi drug resistant
MHA	Mueller Hinton agar
MICU	Medical intensive care unit
NCCLS	National Committee for Clinical Laboratory Standards
NHSN	National Health Care Safety Network
NIT	Nitrofurantoin
NNIS	National Nosocomial Infection Surveillance System
NX	Norflox
OF	Ofloxacin
P	Penicillin
PCCU	Pulmonary critical care unit
PDR	Pan drug resistant
RIF	Rifampicin
STICU	Stroke intensive care unit
Spp.	Species
TEC	Teicoplanin
TET	Tetracycline
TIC	Ticarcillin
TZP	PiperacillinTazobactam
UTI	Urinary tract infection
VAN	Vancomycin
VRE	Vancomycin resistant *Enterococci*
XDR	Extensively drug resistant

ABSTRACT

INTRODUCTION

Bloodstream infection (BSI) is a serious problem in hospitals all over the world. It is defined by a positive blood culture in a patient with systemic signs of infection and may be either secondary to a documented source or primary—that is, without identified origin. It is the most common preventable cause of mortality and morbidity in critically ill patients. Moreover, irrational use of antibiotics is leading to increased drug resistance.

AIMS & OBJECTIVES OF THE STUDY

To identify the bacterial isolates from blood samples and characterize them on the basis of Antimicrobial susceptibility testing. To study association of BSI with CVC and other risk factors.

MATERIALS AND METHODS

The present study was a prospective study conducted in the Department of Microbiology, DMCH, Ludhiana. This was conducted for a period of one year from 1st August 2019 to 31st July 2020. Blood samples collected from various ICUs were processed as per standard protocol and culture positive samples were further characterized according to their antimicrobial susceptibility pattern as per CLSI guidelines.

RESULTS

A total of 5296 patients were admitted in various ICUs and 2425 blood samples were received for culture. Out of which 350 samples obtained from 252 patients (104 paired and 142 unpaired) and from these 252 patients, 256 bacterial and fungal isolates were obtained which were further characterized. Males were more than female's majority were reported from Medical ICU (34.1%). BSI with Gram negative organisms (67.2%) was more than Gram positive (22.7%) and yeast like fungi (10.2%). Gram negative isolates were highly susceptible to tigecycline whereas they were less susceptible to carbapenems, cephalosporins and fluoroquinolones. Most of the Gram positive organisms were sensitive to linezolid, daptomycin, vancomycin and teicoplanin. Most of the *Candida* species were susceptible to antifungals like fluconazole, flucytosine, voriconazole, amphotericin b, caspofungin. Among CONS, 38.7% were MRCONS and among *Staphylococcus aureus* 61.1% were MRSA. Out of 9 *Enterococcal* isolates, 4 (44.4%) were VRE. Among Gram negative isolates, ESBL, AmpC and carbapenemase (MBL/KPC) producers were 24.4%, 18%, 14% respectively. MDR, XDR were 81.7%, 34.8% respectively. 61% were primary BSI while 39% were secondary BSI. CLABSI rate was 1.18/1000 central line days. Incidence rate of BSI was 9.8 per 1000 ICU days. Attack rate of BSI was 4.8%. 56(22.2%) patients expired during hospital stay, 71 (28.2%) were DAMA while 125 (49.5%) recovered

CONCLUSION

As use of antibiotics has increased, it has led to increased antimicrobial resistance and knowledge of antimicrobial resistance pattern and result of culture reports provides guidance for the treatment thus improving outcome of the patient. Also proper precautions, hand hygiene while insertion of catheters and other devices can help in preventing the spread of resistant organisms.

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INTRODUCTION

Bloodstream infection (BSI) is a serious problem in hospitals all over the world.[1] It is defined by a positive blood culture in a patient with systemic signs of infection and may be either secondary to a documented source or primary-that is, without identified origin.[2] It leads to increased length of hospital stay and health care costs.[3] and it is the most common preventable cause of mortality and morbidity in critically ill patients. Globally, bloodstream infection affects about 30 million people causing around 6 million deaths in a year.[4]

BSI can be Hospital acquired BSI (HA-BSI) or community acquired BSI (CA-BSI). HA-BSI or Nosocomial BSI appear after 48 hours of hospital admission or within 24 hrs of discharge from hospital, whereas CA-BSI appear within 48 hours of hospital admission.[2] Nosocomial BSI is a serious complication of hospitalization and has been estimated to be the 8th leading causes of death in the USA.[5] Mostly it was seen that CA-BSI are mainly because of drug susceptible bacteria whereas HA-BSI are mainly because of multi drug resistant bacteria thus making the treatment more difficult.

The rate of BSI is more in patients admitted in the intensive care units (ICU).[6] It is reported that 1.2%- 6.7% of patients admitted in the ICUs develop BSI.[7] There are many risk factors associated with BSI such as longer stay in the hospital,[8, 9] patients on ventilator, comorbidities, immunocompromised, patients on dialysis, critically ill patients at the time of admission.[10, 11]

Bloodstream infections are characterized by the presence of viable bacterial or fungal microorganisms in the bloodstream that elicit inflammatory response and often accompanied by alteration of clinical, laboratory, and hemodynamic parameters.[12] Most common microorganisms causing BSI are Gram-negative bacteria such as *Escherichia coli*, *Pseudomonas aeruginosa*, *Klebsiella* species, *Neisseria meningitidis*, and *Haemophilus influenzae*, and among Gram-positive bacteria such as *Staphylococcus aureus*, *Streptococcus* pneumoniae,

Streptococcus pyogenes, *Streptococcus agalactiae*, coagulase-negative *Staphylococci* (CoNS), and *Enterococcus faecium*[13] followed by various *Candida* species. Coagulase-negative *Staphylococci* (CoNS) is considered significant after repeat isolation.

Bloodstream infections can be primary or secondary. When microorganism isolated in the blood culture coincides with a culture from a distal source, it is known as secondary BSI whereas episodes in which there is no documented distal source are defined as BSIs of unknown origin or primary Blood stream infection.[14] The source of infection is classified as one of the following: lower respiratory tract, intra-abdominal, catheter related, genitourinary tract, skin and soft tissue.

Various symptoms associated with bloodstream infections include fever, chills, reduced vascular tone, low blood pressure, change in mental status, hyperventilation, hypothermia, excessive sweating. Although blood cultures remain as the best means of diagnosing bacteremia and candidemia, complementary testing with antigen tests, microbiologic investigations from other body sites, and histopathology can often aid in the diagnosis of disseminated disease.[15]

Catheter related bloodstream infections (CRBSI) are common and potentially lethal. The extensive use of intravascular catheters, however, is recognized as the most important factor contributing to the occurrence of BSI.[16] Venous catheters, are most frequently associated with the acquisition of a BSI, although arterial catheters can be also involved.[17] Central venous catheters cause more sepsis than peripheral venous catheters. The magnitude of the potential for central venous catheters (CVCs) to cause morbidity and mortality resulting from infectious complications has been estimated in several studies.[18] Local inflammatory signs at the catheter's portal of entry or tunnel have a highly predictive value for infection but its absence has a very poor negative value. As the local signs may be completely absent, the clinical diagnosis of Catheter related Blood stream infection may be difficult. Therefore, microbiological

techniques are necessary to identify CRBSI. With the greater use of catheters this problem is likely to increase.[19]

Catheter-related bloodstream infection (CRBSI) is defined as the presence of bacteremia originating from an intravenous catheter. Central venous catheters (CVCs) pose a greater risk of device-related infections than any other types of medical device and the relative risk for CRBSI is up to 64 times greater with CVCs than with peripheral venous catheters.[17] Elucidation of the pathogenesis of catheter-related bloodstream infections (CRBSIs) has helped in many ways in guiding diagnosis, management, and prevention strategies more effectively.[20]

CLABSI was defined as episodes of sepsis developing in the study patients after 48 h of admission to the ICU with positive cultures from both central line and peripheral venipuncture. Patients with sepsis and a positive central line culture but negative cultures from the peripheral venipuncture/or when peripheral cultures could not be sent due to venous access problems were considered as CLABSI if no other focus of infection was found on clinical examination and investigations (e.g. chest X-ray, urine cultures and abdominal imaging).[21]

All percutaneous catheters are associated with risk of (skin) exit site infection and subsequent migration of that infection along the extra luminal catheter surface to the bloodstream.[22, 23] This risk is reduced either by tunneling the catheter subcutaneously and extending the distance between the catheter–skin interface and the catheter–vessel interface, or by fully implanting the catheter.

Many factors such as catheter site, time of insertion, place of insertion (Emergency, ward, ICU) person who inserted catheter (central line) plays a very important role in CRBSI. Bacterial or fungal contamination of a catheter hub can also lead to intraluminal infection of the catheter and extension of that infection to the bloodstream.[24]

Catheter insertion techniques and indications for placement have evolved and currently about 150 million intravascular devices are used

every year but unfortunately, these catheters can introduce infection to the bloodstream. As a consequence of their increasing use, bloodstream infections resulting from intravascular catheters have become a costly complication of health care system.[25]

Various measures can help in preventing CR-BSIs, a quality improvement team implemented five interventions: educating the staff; creating a catheter insertion cart; asking providers daily whether catheters could be removed; implementing a checklist to ensure adherence to evidence-based guidelines for preventing CR-BSIs; and empowering nurses to stop the catheter insertion procedure if a violation of the guidelines was observed.[26] Hand hygiene and proper technique of insertion also play crucial role in preventing CRBSI.

Treatment of BSI is usually done by timely administration of appropriate antibiotic. Early adequate antimicrobial therapy is a key to improve patient's outcome and should be based on guidelines and direct examination of available samples. ICU-acquired bloodstream infection (ICUBSI) in Intensive Care unit (ICU) is still associated with a high mortality rate.[27] However, since many bacterial pathogens have developed resistance to most of the antibiotics, it has become a serious health problem. There is high bacterial drug resistance to commonly used antibiotics mainly due to the lack of national guideline for antibiotic use, absence of good laboratory facilities to do antimicrobial drug susceptibility test. As a result clinicians use empirical way to treat their patients, there is also high self-treatment without prescription of doctors. These all would lead to emergence and rapid dissemination of resistance.[28]

In severe sepsis attributed to Gram-negative bacteremia, initial treatment with an antibiotic regimen to which the causative pathogen is resistant was associated with increased hospital mortality. This finding suggests that rapid determination of bacterial susceptibility could influence treatment choices in patients with severe sepsis potentially improving their clinical outcomes.[29] Many different definitions for multidrug-resistant

(MDR), extensively drug-resistant (XDR) and pandrug-resistant (PDR) bacteria are being used in the medical literature to characterize the different patterns of resistance found in bacteria. MDR is defined as acquired non-susceptibility to at least one agent in three or more antimicrobial categories, XDR is defined as non-susceptibility to at least one agent in all but two or fewer antimicrobial categories (i.e. bacterial isolates remain susceptible to only one or two categories) and PDR is defined as non-susceptibility to all agents in all antimicrobial categories.[30]

Early detection of resistance in sepsis due to Gram-negative organisms may lead to improved outcomes by reducing the time to effective antibiotic therapy. Traditional methods of resistance detection require incubation times of 18 to 48 h to detect resistance so utilizing automated specimen processing, digital imaging and zone size measurements in conjunction with direct disc susceptibility testing to develop a method for the rapid screening of Gram-negative blood culture isolates for resistance.[31] Thus the gram negative isolates are divided among ESBL producing and NON ESBL producing, AmpC and Non AmpC producing isolates and MBL and Non MBL producing isolates. Similarly, resistance patterns seen in Gram positive organisms like *Staphylococci* include methicilin resistant *Staphylococcus aureus* (MRSA) and methicillin resistant coagulase negative *Staphylococci* (MRCONS) and in *Enterococci* include vancomycin resistant isolates (VRE).So early detection of resistant bacteria may help in appropriate antibiotic therapy and improving the outcome of the patient. Careful attention to barrier precautions and hand hygiene can help in preventing the spread of these resistant organisms.[32]

Microbial agents that are associated with bloodstream infections may be modified via antibiotic administration and other factors specific to the patients such as surgical procedures, trauma, or underlying conditions, or by the quality of specimen collection, transport, and culture.[33] The high level of bacterial resistance to antimicrobials is also believed to be due to easy availability; thus, they are routinely used in many healthcare facilities

and low cost.[34] Moreover, the increasing resistance to the second- and third-generation cephalosporins including cefuroxime and cefotaxime is shown to be associated with the expression or production of extended-spectrum beta-lactamase enzyme .

In various studies on Antimicrobial use and resistance, variations in prescribing antimicrobials in hospitals and rates of resistance in various isolates were analyzed and overall, more than 21% of antimicrobial prescriptions were assessed as inappropriate and thus the rate of resistance in various bacterial isolates has increased and is increasing day by day. This is alarming towards the rationale use of antibiotics.

The prevalence of multi drug resistant pathogens is increasing, continuous surveillance of drug resistance and use of antibiotics according to the updated hospital antibiotic policy is important to decrease the resistance. Therefore, the present study was undertaken to know the microbiological profile of bloodstream infections and to characterize the isolates on the basis of antimicrobial susceptibility testing and also to study the association of BSI with central venous catheters and other risk factors.

AIMS & OBJECTIVES

- To identify the bacterial isolates from blood samples of Blood stream infections in the ICUs and characterize them on the basis of Antimicrobial susceptibility testing.
- To study association of blood stream infections with central venous catheters and other risk factors.

REVIEW OF LITERATURE

Bloodstream infections refer to the presence of microorganisms in blood, which constitute one of the most serious situations among infectious diseases, as they are threat to every organ in the body.

Microbial invasion of bloodstream can have serious immediate consequences such as shock, multiple organ failure, and DIC (disseminated intravascular coagulopathies). Therefore timely detection of the causative agents is one of the most important goals so that appropriate antibiotics can be given timely.

Bacteremia refers to the presence of bacteria in blood without multiplication and septicemia is the condition in which bacteria circulate and actively multiply in the blood stream and may produce their products that can cause harm to the host. Bloodstream infections (BSIs) are serious complications with high mortality and morbidity in patients with critical illness.

Bacteremia may be transient, continuous and intermittent. Pathogens of all four major groups of microbes- bacteria, viruses, fungi and parasites can cause bloodstream infections. As blood is completely sterile and has no normal flora, the presence of microorganism in it indicates failure of the defense mechanisms to maintain its sterility. In many cases, such a failure is of no clinical importance but in other, it is serious and may lead to death of the patient.

With the use of Central venous catheters (CVCs) the morbidity and mortality is increasing .The magnitude of the potential for central venous catheters (CVCs) to cause morbidity and mortality resulting from infectious complications has been estimated in several studies.[18]

There are two major categories of bloodstream infections: Intravascular and Extravascular. Various factors contribute to the initiation of BSI like immune suppression, use of broad spectrum antibiotics, invasive procedures or extensive surgeries that allow the bacteria to access the blood, prolonged survival of debilitated patients.

In a study by Friedman et al[14], 504 patients with bloodstream infections were enrolled. Out of the 504 patients, 28% had community-acquired bloodstream infections (CA-BSIs), 37% had health-care associated bloodstream infections (HCA-BSIs) and 35% had hospital-acquired bloodstream infections (HA-BSIs). Intravascular devices were the most common source of health-care associated and nosocomial infections, and *Staphylococcus aureus* was the commonest pathogen in these types of infections. Methicillin-resistant *S.aureus* occurred with similar frequency in the groups with health-care associated infection (52%) and nosocomial infection (61%) but was uncommon in the group with community-acquired bloodstream infection (14%). Most common pathogens causing community-acquired infections were *E.coli* and *Streptococcus pneumoniae*. Bloodstream infections were labelled as primary in 40% and secondary in 60% cases.

Central venous catheters has increased mortality and morbidity especially in patients admitted in ICUs many folds. The time and place of insertion of central line also matters. As in many cases central line is inserted under emergency conditions where the sterility of the procedure is compromised and it leads to blood stream infections. Nosocomial bloodstream infection was defined by a positive blood culture obtained from patients who had been hospitalized for 48 hours or longer.[35] Community-acquired bloodstream infection was defined by a positive blood culture obtained at the time of hospital admission or within the 48 hours after hospital admission.[14]

Many factors are responsible for increased risk of bloodstream infections such as dialysis, hepatic cirrhosis, diabetes mellitus, immune deficiency syndromes and conditions associated with the loss of normal skin barriers such as serious burns and decubitus ulcers.[36]

Blood stream infections are very much common in ICUs as the rate of infections is quite higher and patients admitted in the ICUs are sick and mainly immune system is compromised. Accompanying the physiological

stress of infections is the increasingly added burden of MDR organisms that hinders therapy of these infections, with consequential adverse clinical and economic results. The ongoing emergence of resistance in the community and hospitals is a major threat for the public health system.[37] It is becoming increasingly difficult to define the epidemiology of MDR organisms within a specific location or healthcare setting, because of the frequent transfer of patients between acute and long-term care facilities as well as patient migration between different regions. The distinction between nosocomial and community-acquired infections is becoming blurred as well, since community-acquired organisms have become important cause of hospital-acquired infections.[38] Describing the magnitude of the problem with respect to these antimicrobial-resistant pathogens is challenging, because the levels of antimicrobial resistance vary for different types of healthcare facilities and from different geographic areas.[39]

Valles et al. conducted an observational study of all adult patients with BSI at ICU admission in 27 Spanish hospitals and 1 Argentine hospital. Of 726 BSIs, 47.2% were CA-BSIs, 34.7% were HA-BSIs and 18% were HCA-BSIs. Potentially antibiotic-resistant pathogens were more frequently isolated in HA-BSIs (34.8%) and HCA-BSIs (27.6%) than in CA-BSIs (10.3%). The most common cause of HA-BSIs and HCA-BSIs was Gam negative bacteria (42.2 and 50.8%) respectively) i.e. *E.coli* followed by *Klebsiella* spp. Gram positive bacteria like *S.aureus* were most frequently isolated from CA-BSIs cases (50.1%). Respiratory tract was the most frequent source of infection in CA-BSIs whereas abdominal infections were the most frequent source in HCA and HA-BSIs. The incidence of inappropriate treatment and crude mortality was significantly higher in HABs and in HCABs than in CABs.[40]

A study was made in Switzerland between 2008 and 2014 aiming to investigate changes in the epidemiology of bloodstream infections. The incidence of bloodstream infections increased throughout the study period, especially among elderly patients and those receiving care in emergency

departments and university hospitals. *Escherichia coli* was the predominant pathogen, with *Enterococci* exhibiting the most prominent increase over the study period.[41]

A study by Baharoon et al. in Saudi Arabia reported 60% of cases due to hospital-acquired infections, and 40% due to community-acquired infections. The majority of the infections acquired in the hospital occurred in medical wards and intensive care units (27% and 21%, respectively). At least one co-morbid condition was present in 94% of the sample patients, with cardiovascular disease and diabetes being the most frequently encountered disorders (58%). Both community and hospital-acquired severe sepsis and septic shock carried very high mortality (58%). The ICU length of stay was significantly longer for hospital and ICU acquired infections.[42]

The modern diagnostic approach play important role in diagnosing resistant pathogens although some resistant pathogens may not be recognized because they are falsely susceptible in routine tests. This can lead to patients receiving ineffective antibiotics and contribute to the spread of the pathogens. Intensive care units, despite their apparent impact on patient outcome, have become high-risk areas for nosocomial infections.[43]

The patient in the ICU has a higher risk of a nosocomial infection compared with the average patient and 20-25% of all nosocomial infections develop in ICU's. Infections due to Gram-negative organisms continue to be one of the leading causes of morbidity and mortality. This is a consequence of a complex interaction between the patient's underlying disease, the severity of illness, the type of ICU, the duration of stay and the number, type and duration of invasive devices and procedures. Medical care of these patients involves closer and more frequent contact with nurses, physicians or technicians.[44, 45] Hand washing and asepsis may be overlooked in urgent conditions, which may further promote horizontal transmission. Empirical and frequent use of broad spectrum antibiotics results in the selection of resistant strains. Thus the ICU patient frequently experiences

colonization and infections by resistant pathogens, which pose major clinical problems despite the introduction of new and potent antibiotics.[46-47] It is important to know the pathogens causing nosocomial bacteremia in the ICUs and their antimicrobial sensitivity to formulate appropriate treatment guidelines. A high prevalence of antimicrobial resistance in isolates causing bacteremia in these critical care wards warrants implementation of strict antibiotic prescribing policies and hospital infection control guidelines.

Mehta et al conducted a study in GMC, Chandigarh from August 2003 to July 2004 reported 567 blood culture positive patients in which males outnumbered the females. Gram negative and Gram positive bacteria accounted for 80.96% and 18% of the isolates respectively. The most frequently isolated Gram negative bacteria were *Pseudomonas aeruginosa* (19.75%), *Escherichia coli* (15.17%), *Klebsiella pneumoniae* (14.99%) and *Salmonella typhi* (12.87%). Among Gram positive bacteria, *Staphylococcus aureus* (13.86%) was the commonest, followed by *Enterococcus* faecalis (2.35%), *Streptococcus* spp. and CONS. High susceptibility to cefoperazone+sulbactum (82.66%) and amikacin (76.61%) was seen in Gram negative isolates. Gram positive isolates showed 100% susceptibility to vancomycin, while 89.74% and 66.7% susceptibility to ciprofloxacin and amoxicillin-clavulanic acid respectively.[48]

A study was conducted by Mathur et al in 6 ICUs of a tertiary care center in New Delhi, India. A total of 152 episodes of nosocomial bacteremia occurred in 140 patients. Of these, 148 (97%) episodes were monomicrobial and 4 (3%) were polymicrobial. Out of the 156 bacterial isolates obtained, *Pseudomonas aeruginosa* (21%) was the commonest isolate. A source of bacteremia was identified in 49 (32%) episodes, with lower respiratory tract being the commonest (49%) source while no distal source could be found in 103 (68%) episodes. Overall, Gram negative bacteria accounted for the majority (71%) of isolates. Out of Gram negative isolates, 89% were ESBL producers and a high rate of resistance was observed against amikacin

(82%) and ciprofloxacin (93%). Multidrug resistance was also seen in Gram positive cocci. Of the *S.aureus*, 58% were MRSA and 40% of the coagulase negative *Staphylococci* were methicillin resistant. All isolates of *Enterococci* showed high level aminoglycoside resistance (HLAR), but vancomycin resistance was found in 1 isolate.[49]

A study was conducted by Wei-Li-Zhang et al in 2018 aiming to analyze the risk factors for mortality of blood stream infections (BSIs) caused by *Escherichia coli*. It was a 5 year study and they concluded that less than 10% of the isolates were resistant to carbapenems and amikacin. Between ESBL-EC group and non-ESBL-EC group, The clinical symptoms, prior use of antibiotics or antifungal agents ,risk factors for infection,30 d mortality rates were not significantly different (P>0.05). A logistic regression analysis confirmed that inappropriate initial antibiotic therapy were independent risk factors for 30 d mortality. Therefore the use of effective antimicrobial treatment as early as possible could reduce the risk of death in patients suffering *Escherichia coli* BSIs.[50]

A study was conducted by Yoto Haruki et al in 2018.This study retrospectively compared the clinical characteristics and outcomes of critically ill patients in an intensive care unit (ICU) at the Tsuyama Chuo Hospital (Okayama, Japan) who were hospitalized for bacteremia caused by ESBL-producing *Escherichia coli* (ESBL-EC) or non-ESBL-producing *E.coli* (non-ESBL-EC) between January 2006 and December 2016 (11 years). They analyzed the patients' age, sex, underlying disease(s), sequential organ failure assessment scores, primary focus of bacteremia, empiric antibiotics, rate of appropriateness of empiric antibiotics, and treatment duration, with 28-day mortality being the primary outcome. The study included 24 patients with ESBL-EC bacteremia and 77 with non-ESBL-EC bacteremia. The rate of appropriate initial antibiotic treatment was significantly lower and the mortality due to bacteremia significantly higher in the ESBL-EC than in the non-ESBL-EC bacteremia group. Initial empiric

antibiotic therapy covering ESBL-producing pathogens should be considered for critically ill patients in the ICU.[51]

A study was conducted by Grazia Brunetti et al in 2019 aiming *Candida* blood stream infections in a tertiary care hospital. *Candida* bloodstream infection (BSI) represents a growing infective problem frequently associated to biofilm production due to the utilization of intravascular devices. *Candida* species distribution their biofilm production and hospital antifungal drug consumption were evaluated in a tertiary care academic hospital in Italy during the years 2011-2016. In the considered time window, an increasing number of *Candida* BSI and of biofilm producing strains were observed. Although *C.albicans* was the species more frequently isolated in BSI with a major biofilm production, an increased involvement of non-albicans species was reported, particularly of *C.parapsilosis* that displayed a high frequency in catheter infections, and lower biofilm production compared to *C.albicans*. Antifungal drugs consumption was analyzed and compared. In conclusion, drug utilization in their hospital turned out to be a putative influencing factor on the ecology of the species, on the increase in time of the biofilm producing strains and on the *Candida* antifungal susceptibility profile, thus influencing clinical management.[52]

A study conducted by Ayobola et al. reported that in positive blood cultures Gram negative isolates (77.1%) were more as compared to Gram positive (22.9%) isolates. The most commonly isolated organism from all patients was *Staphylococcus aureus* 7(14.6%) followed by an equal frequency of occurrence of *Pseudomonas aeruginosa*, *Enterobacter* spp., *Klebsiella pneumonia* and *Proteus mirabilis*; each having 6 (12.5%) isolates. The least common were *Citrobacter freundii* 3 (6.3%), *Escherichia coli* 4 (8.3%) and *Staphylococcus epidermidis* 4 (8.3%). All the bacteria recovered from blood culture showed the highest degree of resistance to tetracycline (95.8%), amoxicillin-clavulanic acid (93.8%) and amoxicillin (91.7%). The Gram negative bacilli showed a high degree of resistance to

commonly used antibiotics with the highest to tetracycline (100%), amoxicillin (97.3%), nitrofurantoin and cotrimoxazole (81.1%) with a comparatively low resistance to ofloxacin (18.9%). Gram positive cocci were highly resistant to tetracycline (81.8%), amoxicillin-clavulanic acid and amoxicillin (72.7%), but were highly sensitive to ofloxacin (90.9%).[53]

A study was made by Diana Carolina Velasquez Reyes et al in 2017 where they study the association of blood stream infections with central venous catheters and their prevention. There is a high risk of bloodstream infection associated with the central venous catheters despite their benefits. A range of interventions were found to be used for the prevention or reduction of central venous line associated bloodstream infections. These interventions included dressings, closed infusion systems, aseptic skin preparation, central venous line bundles, quality improvement initiatives, education, an extra staff in the Intensive Care Unit and the participation in the 'On the CUSP: Stop Blood Stream Infections' national program and they concluded that central venous line associated bloodstream infections can be reduced by a range of interventions including closed infusion systems, aseptic technique during insertion and management of the central venous line, early removal of central venous lines and appropriate site selection.[54]

In a study made by Hye Kyung Seo, A total of 154 CLABSIs were identified, of which 72 (46.8%) occurred in general wards and 82 (53.2%) in ICUs (0.81 and 2.71 per 1,000 catheter days), respectively showing that rate of CLABSI is more in ICUs than wards as patients admitted in the ICUs are more sick, immunocompromied, thus mortality and morbidity of patients admitted in ICUs is greater.[55]

Aynur atillia et al conducted a study to determine: CLABSI: Characteristics and risk factors for mortality. Central line-associated bloodstream infections (CLABSIs) are associated with substantial morbidity and mortality and the infection rates vary in a wide range in developing countries. A total of 166 CLABSI episodes in 158 patients out of 17,553 on 38,562 catheter and 94,512 hospitalization days were evaluated. The

infection developed in catheterized patients at a median of 14 days (range 2-88), Of the patients catheterized, 54.4% survived whereas 45.6% died. In patients having *Candida* infection, the mortality was significantly higher. High APACHE II scores and *Candida* infections were found to be significant risk factors associated with mortality.[56]

In a study conducted in Lowa, a total of 1,745 patients developed nosocomial bloodstream infection. Polymicrobial infections accounted for 14% (247) of the episodes. Gram-positive cocci (55%) were the organisms most commonly responsible for nosocomial bloodstream infections. CONS (25%) were the most common isolates, followed by *S.aureus* (15%), *E.coli* (7.9%), *Candida* spp. (6.5%) and *Klebsiella* spp. (6.2%).[57]

During one year study period out of 9010 blood cultures studied, 1258 were found to be positive (13.9%) for bacterial growth. Gram positive (49.3%) and Gram negative (50.7%) isolates were obtained in almost equal frequency. Among Gram positive cocci, *Staphylococcus aureus* was the commonest isolate (37.2%), followed by *Staphylococcus epidermidis* (7.1%) and *Enterococcus* faecalis (1.8%). The most commonly isolated Gram negative bacilli were *Escherichia coli* (20.3%), *Salmonella typhi* and *Paratyphi* A (14.6%), *Pseudomonas aeruginosa* (8.2%) and *Acinetobacter* spp. (4.3%). All isolates of *Salmonella* spp. and *Streptococcus pneumoniae* were sensitive to all the antimicrobial agents used. In *S.aureus* isolates, vancomycin and tetracycline were most effective while penicillin, ampicillin & gentamicin were least effective. MRSA were isolated in 40.8% cases. No vancomycin resistant *S.aureus* and *Enterococci* were detected.[58]

A study in Germany detected 24,179 cases of nosocomial BSI in 49 US hospitals over a 7-year period (60 cases per 10,000 hospital admissions). 87% of BSIs were monomicrobial. Gram positive and Gram negative organisms accounted for 65% and 25% of the BSIs. Fungi (mainly *Candida* spp.) was isolated in 9.5% episodes. The crude mortality rate was 27%. The most common organisms causing BSIs were coagulase negative *Staphylococci* (CONS) (31%), *Staphylococcus aureus* (20%), *Enterococci*

(9%) and *Candida* species (9%). *E.coli* (6%) and *Klebsiella spp*. (5%) were the most common Gram negative organisms. The mean interval between admission and infection was 13 days of infection with *Escherichia coli*, 16 days for *S.aureus*, 22 days for *Candida* spp. and *Klebsiella* spp., 23 days for *Enterococci* and 26 days for *Acinetobacter* spp. CONS, *Pseudomonas* species, *Enterobacter* species, *Serratia* spp. and *Acinetobacter* spp. were more likely to cause infections in patients in intensive care units.[59]

In a retrospective study in Ethiopia, out of 390 blood cultures, 71 (18.2%) were culture positive. The Gram positive and Gram negative bacteria constituted 49 (69%) and 22 (31%) of the culture isolates respectively. The predominant bacteria isolate from blood culture were coagulase negative *Staphylococci* 30 (42.3%), followed by *S.aureus* 17 (23.9%), *Klebsiella* spp. 9 (12.9%), *E.coli* 5 (7%), *Pseudomonas aeruginosa* 4 (5.6%), *Salmonella* spp. 3 (4.2%). The isolates showed high rates of resistance to most antibiotics tested. The range of resistance for Gram positive and Gram negative were from 23.5 – 58.8% and 20 – 100% respectively. *Klebsiella* spp. were resistant to ampicillin (75%), cotrimoxazole (50%), tetracycline (75%), chloramphenicol (62.5%), amoxicillin (62.5%) and ceftriaxone (62.5%). *E.coli* were resistant to ampicillin (100%), tetracycline (60%) and chloramphenicol (40%). *Salmonella* spp. were resistant to chloramphenicol (100%), gentamicin, ampicillin, ceftriaxone, cotrimoxazole (66.7% each). 58.8% of *S.aureus* isolates were resistant to erythromycin, cotrimoxazole and penicillin-G. Relatively ciprofloxacin was fairly effective against both Gram positive and Gram negative isolates.[13]

A study conducted by Jason P et al in 2018 showed that Central-line-associated bloodstream infections (CLABSIs) are responsible for ~1/3 of all deaths from healthcare-associated infections in the United States. Of these, multidrug-resistant organisms (MDROs) are responsible for 20% to 67%. Our objective was to determine the relationship between failure to remove a central venous catheter (CVC) and 30-day all-cause mortality in patients

with MDRO CLABSIs. It was a retrospective study in which patients with a multidrug-resistant *Staphylococcus aureus*, *Enterococcus* species, *Enterobacteriaceae*, *Acinetobacter* species, or *Pseudomonas aeruginosa* CLABSI were studied. The CLABSIs were assessed prospectively at the time of occurrence by infection prevention specialists. A total of 430 patients met inclusion criteria, 173 (40.2%) with *Enterococcus*, 116 (27.0%) *Enterobacteriaceae*, 81 (18.8%) *S.aureus,* 44 (10.2%) polymicrobial, 11 (2.6%) *Pseudomonas aeruginosa*, and 5 (1.2%) *Acinetobacter* CLABSIs. Removal of a CVC occurred in 50.2% of patients, of which 4.2% died by 30 days (n = 9). For patients whose CVC remained in place, 45.3% died (n = 97). Failure to remove a CVC was strongly associated with 30-day all-cause mortality. Other risk factors for 30-day mortality included patient comorbidities (cardiovascular disease, congestive heart failure, cirrhosis), and being in an intensive care unit at the time of MDRO isolation. This suggests that patients presenting with MDRO CLABSIs should all undergo CVC removal.[60]

A study conducted by Laupland et al. reported 199 ICU-acquired BSI episodes among 4933 ICU admissions for a cumulative incidence of 4% and an incidence density of 5.4 per 1000 ICU days. The most common isolates were *Staphylococcus aureus* (18%), coagulase-negative *Staphylococci* (11%) and *Enterococcus faecalis*(8%); 12% of infections were due to antimicrobial-resistant bacteria. The crude in-hospital death rate was 45% for patients with ICU-acquired BSI compared with 21% for those without. Development of an ICU-acquired BSI increase mortality and poor outcome of patient many folds.[61]

Nowadays antimicrobial resistance is increasing day by day as clinicians mainly start antibiotic before the reports of culture, this is a major issue which is increasing day by day. Gram-positive and Gram-negative bacteria are both affected by the emergence and rise of antimicrobial resistance. As this problem continues to grow, definitions to describe and classify bacteria that are resistant to multiple antimicrobial agents are

needed, so that epidemiological surveillance data can be reliably collected and compared across healthcare settings and countries. Multidrug-resistant organisms (MDROs) are labelled as such because of their in vitro resistance to more than one antimicrobial agent. Infections with MDROs can lead to inadequate or delayed antimicrobial therapy and are associated with poorer patient outcomes.[62-64] Of the MDROs, highly-resistant Gram-negative bacteria (e.g. multi-drug-resistant carbapanemase-producing *Klebsiella pneumoniae* and *Acinetobacter* spp.) require special mentions; these organisms can be resistant to all currently available antimicrobial agents or remain susceptible only to older, potentially more toxic agents such as the polymyxins, leaving limited and sub-optimal options for treatment.[65, 66] Therefore this increasing antimicrobial resistance is becoming threat to the present healthcare system as it is also decreasing options as new antimicrobial agents to which the isolate is susceptible are decreasing.[67]

Central venous catheters (CVCs) are commonly used in critically ill patients and offer several advantages to peripheral intravenous access. However, indwelling CVCs have the potential to lead to bloodstream infections, with the risk increasing with an array of characteristics, such as catheter choice, catheter location, insertion technique, and catheter maintenance. Evidence-based guidelines have led to a significant reduction in the incidence of bloodstream infections associated with CVCs. The combination of guideline implementation and newer technologies has the potential to further reduce morbidity and mortality from infections related to CVCs.

In a study conducted by Walz J M et al aiming various methods to prevent the central venous catheter associated blood stream infection. The majority of nosocomial bloodstream infections in critically ill patients originate from an infected central venous catheter (CVC). Catheter-related bloodstream infections (CRBSIs) cause significant morbidity and mortality and increase the cost of care. The most frequent causative organisms for

CRBSI are coagulase-negative *Staphylococci* (CoNS), *Staphylococcus aureus*, *Enterococci*, and *Candida* species. The path to infection frequently includes migration of skin organisms at the insertion site into the cutaneous catheter tract, resulting in microbial colonization of the catheter tip and formation of biofilm. Evidence-based strategies for the prevention of CRBSI include behavioral and educational interventions, effective skin antisepsis coupled with maximum barrier precautions, the use of antiseptic dressings, and the use of antiseptic or antibiotic impregnated catheters. Achieving and maintaining very low rates of CRBSI requires a multidisciplinary approach involving the entire health care team, the use of novel technologies in patients with the highest risk of CRBSI, and frequent reeducation of staff. All these measures if seriously implicated can decrease CLABSI to greater extent.[68]

In one of the International Cohort Study conducted in 162 intensive care units (ICUs) in 24 countries, 1,156 patients were included [mean ± standard deviation (SD) age, 59.5 ± 17.7 years; 65% males]; with HA-BSIs, of which 76% were ICU-acquired. Median time to diagnosis was 14 days after hospital admission. Polymicrobial infections accounted for 12% of cases. Among monomicrobial infections, 58.3% were Gram-negative, 32.8% Gram-positive, 7.8% fungal and 1.2% due to strict anaerobes. Overall, 629 (47.8%) isolates were multidrug-resistant (MDR), including 270 (20.5%) extensively resistant (XDR) and 5 (0.4%) pan-drug-resistant (PDR).[69]

Central venous catheter (CVC) infection is a common problem during hospitalization and hospital associated bloodstream infection in these patients is associated with increased morbidity, mortality and health care cost.[70]

One more method that has been used as an index of catheter-related bacteremia is semi quantitative culture of catheter tips. In a study made by Collignon et al., 780 tips from central vein catheters inserted into 440 critically ill patients in an intensive care unit. When 5 or more colonies per

plate were taken as a positive result, the sensitivity of the method was 92% and specificity was 83%. Although the predictive value of a negative result was excelled (99.8%), the predictive value of a positive result was low (8.8%) in the patient population, which had a relatively low incidence of catheter-related bacteremia (2%). They concluded that a semi quantitative culture technique to useful in the diagnosis of bacteremia associated with central vein catheters.[71]

Garrouste et al. in a study found out that the estimated risk of death from BSI varied considerably according to the source and resistance of organisms, time to onset and appropriateness of treatment. Of 3247 patients with ICU says of >3 days, 232 experienced BSI by day 30 (incidence, 6.8 cases per 100 admissions). Crude hospital mortality was 61.5% among exposed and 36.7% among unexposed patients. Attributable mortality was 24.8%.[8]

In another study made by Dang ping fang et al in 2019, the purpose of which was to carry out a Bayesian network meta-analysis comparing the efficacy of different antimicrobial dressings for prevention of catheter-related blood infections (CRBSI) and rank these antimicrobial dressings for practical consideration. In this study 8494 patients involving 13 dressings were evaluated. It showed that transparent dressing may be the best way to prevent CRBSI. Suture and bordered polyurethane dressing might have the lowest risk of CRBSI rate per 1000 catheter-days, and suture less securement device might lead to the lowest incidence of catheter failure and they finally concluded that transparent dressings may be selected for the prevention of CRBSI in patients with central venous catheters, which is of importance in future research and may improve the patient outcome and may decrease the mortality rate associated with the use of central venous catheters.[72]

MATERIAL AND METHODS

The present study was a prospective study conducted in the Department of Microbiology, Dayanand Medical College and Hospital, Ludhiana. This was conducted for a period of one year from 1st August 2019 to 31st July 2020.

Source of Data

Patients admitted in ICUs.

Inclusion Criteria

All patients admitted in ICUs.

Exclusion Criteria

1. Patients admitted in wards.
2. Patients less than 18 years of age.

For each patient, only one bloodstream infection episode and, for each episode, only the first samples were considered. In the case of two or more episodes observed in the same patient, only the first was considered. A bloodstream infectious episode was defined as a time-period associated with one or more blood cultures positive for the same organism/organisms.[73]

Data Collection

The following data was collected:-

- Patient detail including: Name, Age, Sex, C ICU, Date & Time of admission to hospital, date & time of admission to ICU.
- Clinical presentation and provisional diagnosis
- Information like any comorbid illness, any instrumentation, any organ dysfunction, antibiotic history
- H/o previous hospitalization
- Any other infection
- Date & time of collection of sample
- Specimen lab ID No.
- Blood culture report- Gram stain, identification, antimicrobial

susceptibility

- Outcome of patient

Sample collection

- **Blood sample**- Under all aseptic conditions, 10-12 ml of blood was withdrawn from antecubital vein with a disposable syringe and was inoculated directly into commercially prepared BACTEC 9240 or BacT/Alert culture bottles.
- **Central venous catheter tip-** After disinfecting the skin around the catheter insertion site, the CVC was removed and the proximal 5 cm segment was cut with sterile blade and put in a sterile screw capped container.

  The samples were transported immediately to the laboratory.

Sample processing

The samples received in the microbiology lab were processed as per standard protocols. The blood culture bottles will be loaded for a maximum period of 7 days or till the bottle flag positive by the system and time of positivity will be noted.

- **Blood specimen** was processed in the BACTEC or Bac-T/Alart microbial detection system. The blood culture bottles were loaded in the instrument and incubated for a maximum period of 7 days or till the bottle was indicated positive by the system and time to positivity was noted. Bottles were placed into receiving wells that were monitored once every 10 minutes. The voltage of current reading of diode was compared with the previous reading. If the voltage change exceeded a present delta value, the microcomputer flagged the bottle as positive.
- **The Bac-T/Alert** microbial detection system utilizes a calorimetric sensor and reflected light to monitor the presence and production of CO2 that is dissolved in the culture medium. If microorganisms are present in the test sample, CO2 is produced as the organisms metabolize and substrate in the culture medium. When growth of the

microorganism produces CO2, the color of the gas-permeable sensor installed in the bottom of each culture bottle changes from blue green to yellow.

- **The BACTEC** uses fluorescent light to detect changes in the concentration of CO2 in the blood broth mixture. When growth of the microorganism produces CO2, its sensor emits a fluorescent light that passes an emission filter on the way to a light sensitive diode.

Processing of blood culture positive bottles

Smears were prepared from the positive blood culture bottles and Gram staining of the smears was done. Simultaneously the sample from all the positive bottles was sub cultured on blood agar and MacConkey's agar plates. The plates were incubated at 37°C for 18-24 hours.

Processing of catheter tip

The catheter tip was inoculated on the Blood Agar plate by Roll plate method.

Roll plate method (Maki et al.)[74]

The catheter tip was cultured by the semi-quantitative method – Roll plate method on blood agar plate. A 5 cm catheter segment was transferred to the surface of blood agar and rolled back and forth across the surface at least 4 times. The plate was examined after overnight incubation. Smears prepared from the growth were examined after Gram staining.

The presence of 15 or more colony forming units (CFUs) was considered indicative of catheter colonization.

Media used

1. Blood Agar: The medium was prepared by adding 5-10% sterile animal (sheep) blood to sterile 2% nutrient agar (peptic digest of animal tissue, NaCl, beef extract) that was melted and cooled to 50°C. Double layered blood agar was prepared. A thin layer of melted nutrient agar, about 7 ml for a 9 cm petri dish, was poured and allowed to set. Then a thin layer of 5% blood agar was poured on top of the first layer.

2. MacConkey's Agar

Peptone	20g
Sodium taurocholate	5g
Water	1L
Agar	20g
Neutral red solution, 2% in 50% ethanol	3.5ml
Lactose, 10% aqueous solution	100ml

Preparation of media

Peptone and sodium taurocholate (bile salt) were dissolved in the water by heating. The agar was added and dissolved in the steamer or autoclave. pH was adjusted on 7.5. Lactose and neutral red were shaken, mixed and added. The medium was heated in the autoclave with free steam (100°C) for 1 hour, then at 115°C for 15 min and was poured in the plates.

Identification & antimicrobial susceptibility testing

Growth was identified by the colony characteristics, Gram staining and the VITEK 2 system. Suspensions were prepared by emulsifying bacterial isolates in 0.45% saline to the equivalent of a 0.5 McFarland turbidity standard. The same suspension was used for identification and AST for the VITEK 2 system. The 0.5 McFarland bacterial suspension was diluted to 1.5 × 107CFU/ml in 0.45% saline. Cards were automatically filled, sealed and loaded into the VITEK 2 instrument for incubation and reading. Each positive blood culture was critically assessed and categorized as either clinically significant or not significant (contaminant), taking into account organism identification, clinical signs and symptoms, white blood cell (WBC) count number of positive blood cultures out of the total number drawn, results to other cultures and clinical course.

Identification of the Gram positive organisms and Gram negative organisms was done by using AST-GP628 card & AST-GN280/281 cards, respectively.

The AST-GP628 card used for antimicrobial susceptibility testing of Gram positive organisms contained benzylpenicillin, oxacillin, gentaminic,

ciprofloxacin, levofloxacin, erythromycin, clindamycin, daptomycin, linezolid, vancomycin. It also contained high level gentamicin and high level streptomycin for *Enterococci*.

For Gram negative organisms, AST-GN280 card test for lactose fermenters and AST-GN281 for non-lactose fermenters and non-fermenters was used. The AST-GN280 card for lactose fermenters contained antibiotics amikacin, gentamincin, ciprofloxacin, ampicilin, cefepime, ceftriaxone, cefuroxime, amoxicillin / clavulanic acid, cefoperazone / sulbactam, piperacillin/tazobactm, ertapenem, imipenem, meropenem, trimethoprim-sulfamethoxazole, colistin and tigecycline. The AST-GN281 card for non-lactose fermenters and non-fermenters contained amikacin, gentamicin, ciprofloxacin, levofloxacin, cefepime, ceftazidime, cefoperazone/sulbactam, piperacillin/tazobactam, ticarcillin/calvulanic acid, doripenem, imipenem, meropenem, aztreonam, minocycline, trimethoprim-sulfamethoxazole, colistin and tigecycline.

Yeast identification was done by YST-007 card which contained amphotericin B, fluconazole, flucytosine, voriconazole and caspofungin.

Quality control

ATCC strains of *Escherichia coli* 25922, *Pseudomonas aeruginosa* 27853, *Staphylococcus aureus* 25923 and *Candida parapsilosis* 22019 were used as quality controls.

Interpretation of results

In order to evaluate MIC results, CLSI (Clinical & Laboratory Standards Institute) recommendations were used.[43]

Characterization of microorganisms

Screening for ESBL, AmpC and carbapenemases (MBL/KPC) production in Gram negative bacteria.

The Mueller Hinton Agar (MHA) plate was inoculated using a swab that has been submerged in a bacterial suspension (Standardized to match the turbidity of 0.5 McFarland) by lawn culture method. It was swabbed by rotating it three times at angle of 60° to ensure an even and complete

distribution of the inoculums over the entire plate. Within ten minutes of inoculation the antimicrobial discs were applied. The antimicrobial discs used for screening procedure were cefotaxime and ceftazidime (for ESBLs), cefoxitin (for AmpC-ß-lactamase) and ertapenem (for carbapenemase). These discs were applied on the plates and then the plates were incubated at 35-37°C for 24 hour as per CLSI Guidelines. The plates were examined to confirm that a confluent lawn of good growth has been obtained. Then zones of inhibition were measured and compared with the Performance Standards of Antimicrobial Disc Susceptibility Test provided by CLSI.[43]

ENZYME	ANTIMICROBIAL DISC	ZONE SIZE INDICATING RESISTANCE
ESBLs	Ceftazidime Cefotaxime	≤22 cm ≤26 mm
AmpCβ-lactamases	Cefoxitin	<18 mm
Carbapenemases (MBL/KPC)	Ertapenem (10μg) Meropenem(10μg)	19-21 mm 16-21 mm

Interpretation: If the zone size is as mentioned above, the organism was labeled as probable ESBL/AmbC or carbapenemase (MBL/KPC) producer and subjected to confirmatory tests.

Media used

Mueller Hinton Agar

Composition

Beef infusion 300 ml

Casein hydrolysate 17.5 g

Starch 1.5 g

Agar 10 g

Distilled water 1 litre

Preparation: Starch was emulsified in a small amount of cold water. This was poured into beef infusion, to this casein hydrolysate and agar was added. The volume was made up to 1 litre with distilled water. Constituents were dissolved by heating at 100°C with agitation. pH was adjusted to 7.4. It was autoclaved at 121°C for 20 min and then poured in plates.

Confirmatory Tests

ESBL- Double Disc Diffusion Test (DDDT)

The lawn culture of test organism was done on MHA. The discs of ceftazidime alone (30µg) and in combination with clavulanic acid (10µg) or cefotaxime (30µg) alone and in combination with clavulanic acid (10µg) were applied on the plate. The discs were placed in such a way that the center to center distance between the discs was minimum 30 mm. The MHA plate were incubated at 35°C for 24 hours as per CLSI guidelines.[43]

Interpretation- An expansion of zone of inhibition ≥5 mm around the combination disc was considered a positive result.

AmpC- AmpC Disc Test[75]

A lawn culture of *E.coli* ATCC 25922 was prepared on a MHA plate and a cefoxitin disc (30µg) will be placed on the plate. AmpC disc (filter paper disc containing Tris-EDTA) was moistened with 20□l of sterile saline and inoculated with colonies of test organism. This disc was then placed beside the cefoxitin disc (almost touching) with the inoculated side facing downwards. The MHA plate was incubated at 35°C for 24 hours.

Interpretations- If there was flattening or indentation of cefoxitin inhibition zone, it was considered as an AmpC producer.

Carbapenemases [Metallo-ß-lactamase (MBL)/ *Klebsiella pneumoniae*carbapenemases (KPC)] – Modified Hodge Test (MHT)[43,76]

A 0.5 McFarland standard suspension of *E.coli* ATCC 25922 was prepared in saline and was diluted 1:10 in saline. A lawn culture was prepared on MHA plate as for the routine disc diffusion method. The plates were allowed to dry for 3-10 minutes. One 10µg ertapenem disc was placed

at the center of the plate. Then using a 10□l loop, 3-5 colonies of the test organism were picked at inoculated in a straight line out from the edge of the disc. The streak was 20-25 mm in length. The plate was incubated at 35-37°C for 24 hrs.

Interpretation- Enhanced growth around the test organism at the intersection of the streak and the zone of inhibition was considered positive for carbapenemases (MBL/KPC).

MDR/XDR/PDR Characterization:

There are various definitions for multidrug-resistant (MDR), extensively drug-resistant (XDR) and pandrug-resistant (PDR) bacteria are being used in the medical literature to characterize the different patterns of resistance found in healthcare-associated, antimicrobial-resistant bacteria. MDR was defined as acquired non-susceptibility to at least one agent in three or more antimicrobial categories, XDR was defined as non-susceptibility to at least one agent in all but two or fewer antimicrobial categories (i.e. bacterial isolates remain susceptible to only one or two categories) and PDR was defined as non-susceptibility to all agents in all antimicrobial categories. The recent increase in drug-resistant micro-organisms has made the management of hospital-acquired bloodstream infections (HA-BSIs) more difficult and also result in the poor outcome of the patient.

Vancomycin and high level aminoglycoside resistance (HLAR) in *Enterococci*[43]

HLAR and vancomycin resistance in the *Enterococcal* isolates was determined by the VITEK 2 system and VRE was manually confirmed by preparing agar plates containing 6µg of vancomycin per ml with Brain heart infusion media. A 0.5 McFarland suspension of the *Enterococcus* isolate was prepared. 1µl of the suspension was spotted on the surface of the agar. The plates were then incubated for 18-24 hours at 35°C. Presence of growth indicated resistance to vancomycin.

Test for detection of Methicillin resistant *S.aureus* (MRSA) and Methicillin resistant Coagulase negative *Staphylococcus* (MRCONS)[43]

Screening for MRSA and MRCONS was done by the VITEK 2 system. Cefoxitin disc diffusion was performed on *S. aureus* isolates using a 30µg disc. A 0.5 McFarland standard suspension of the isolate was prepared and lawn culture was done on MHA plate. Cefoxitin disc was applied and plates were incubated at 37°C for 24 hours. Zone diameters were measured and interpreted as follows:

Confirmatory test for MRSA

	Resistant	Sensitive (mm or more)
S. aureus	21	22
CONS	24	25

Interpretation- Organism was labeled as MRSA and MRCONS on the basis of zone size indicated above.

The following rates were calculated as follows:

- Incidence rate of BSI = $\frac{\text{No.of new BSIs}}{\text{Total No.of ICU days}} \times 1000$
- Attack rate (cumulative incidence rate) of BSI = $\frac{\text{No.of new BSIs}}{\text{Total No.of ICU admissions}} \times 100$
- CLABSI rate per 1000 central line days = $\frac{\text{No.of CLABSI cases}}{\text{No.of Central line days}} \times 1000$

Statistical analysis

Data obtained from the study was put to appropriate statistical analysis by Chi Square Test, Fisher's Exact Test and ‘t’ test. p value <0.05 was considered significant.

OBSERVATIONS AND RESULTS

This prospective study was conducted over a period of one year (August1, 2019-July 31, 2020) in the department of Microbiology, DMCH, Ludhiana.

During this period a total of 5296 patients were admitted in various ICUs and 2425 blood samples were received for culture. These 2425 samples were received from 1291 patients (725 paired and 975 unpaired). Out of these 2425 blood samples received for culture 435 samples were positive out of which 350 samples were included for further study and rest were probable contaminants. These 350 samples were obtained from 252 patients (104 paired and 142 unpaired) and from these 252 patients, 256 bacterial and fungal isolates were obtained. Only the first episode of bloodstream infection (BSI) was analysed, rest were excluded. The bacterial and fungal isolates obtained from these samples were identified and antimicrobial susceptibility pattern was determined by VITEK 2 system. The isolates were then characterized as Multidrug resistance (MDR), extensively drug resistant (XDR) and Pandrug resistant (PDR). Prevalence of extended spectrum ß lactamases (ESBL), AmpC ß lactamases (AmpC) and carbapenemases (MBL) production among Gram negative isolates and methicillin resistance and vancomycin resistance among Gram positive isolates was studied.

All the results are depicted in the tables and graphs that follow: Out of 256 isolates, 172 (67.2%) were Gram negative bacteria, 58 (22.6%) were Gram positive bacteria, 26 (10.2%) were yeast like fungi.

TABLE 1: AGE WISE DISTRIBUTION OF PATIENTS WITH BSI (n=252)

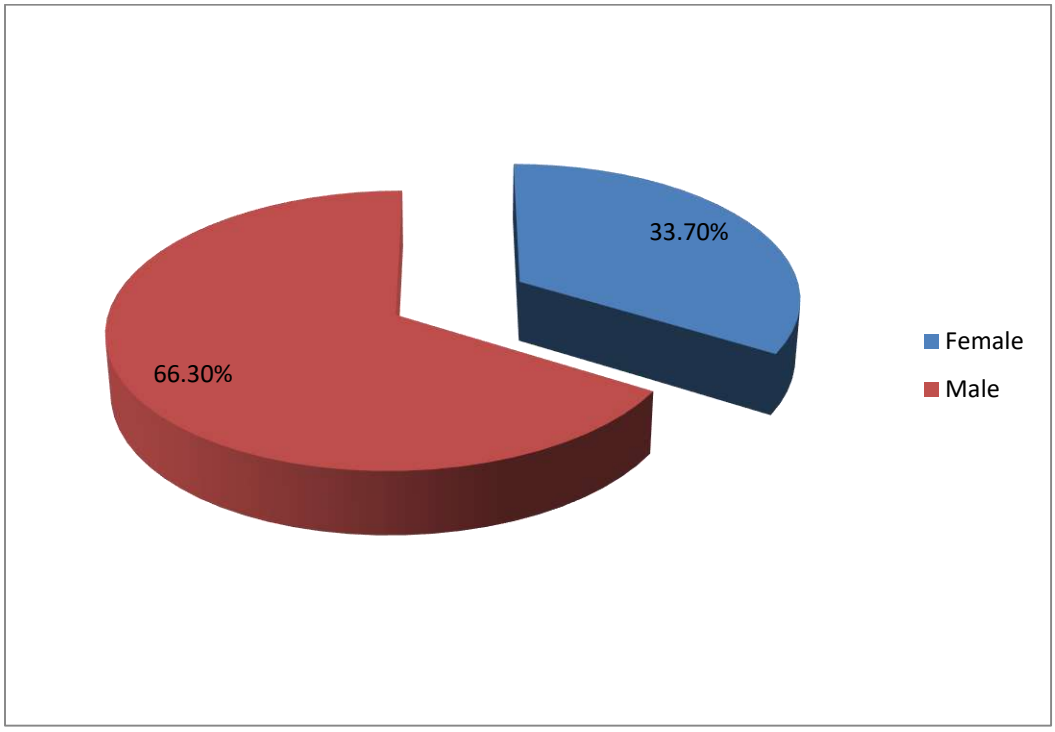
Age(Years)	No. of cases	Percentage
18-20	6	2.4
21-30	32	12.7
31-40	41	16.1
41-50	40	15.9
51-60	72	28.6
61-70	41	16.3
71-80	12	4.8
81-90	8	3.2
Total	252	100

Majority of patients were in the age group of 51-60 years (28.6%), followed by patients aged 61-70years (16.3%).The average age of the patients enrolled was 49.7±15.7 years.

TABLE 2: SEX WISE DISTRIBUTION OF PATIENTS WITH BSI (n=252)

Gender	No. of cases	Percentage
Female	85	33.7
Male	167	66.3
Total	252	100

FIGURE 1: SEX WISE DISTRIBUTION OF PATIENTS WITH BSI (n=252)



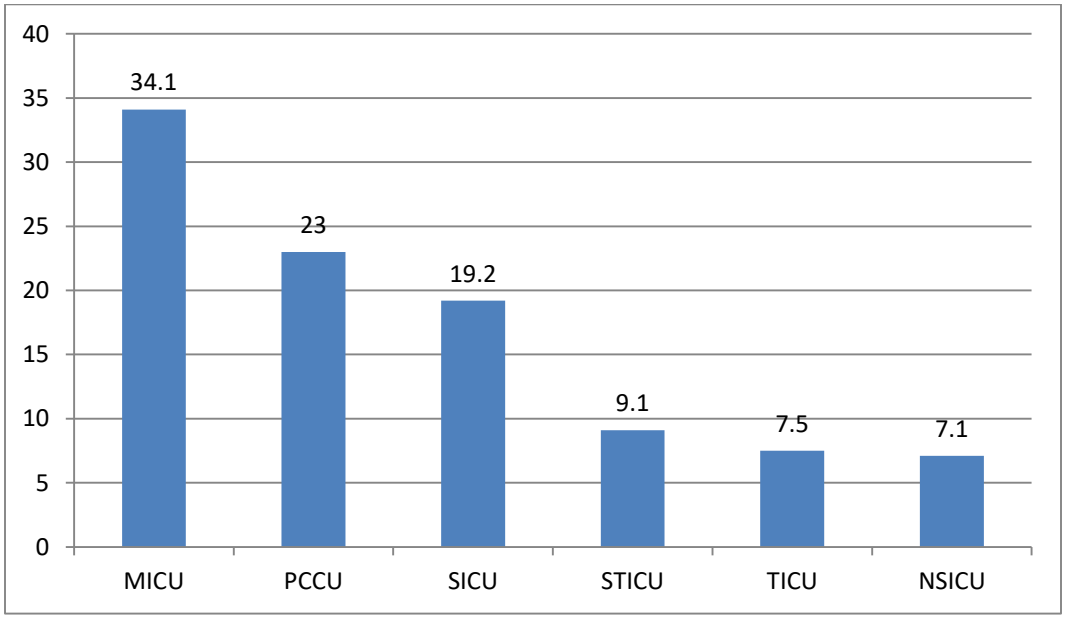
Majority of patients with Blood stream infections (BSI) were males (66.3%) and 33.7% were females.

Male:Female 2:1

TABLE 3: AREA WISE DISTRIBUTION OF PATIENTS WITH BSI (n=252)

AREA	No. of cases	Percentage
MICU	86	34.1
PCCU	58	23
SICU	48	19.2
STICU	23	9.1
TICU	19	7.5
NSICU	18	7.1
Total	252	100

FIGURE 2: AREA WISE DISTRIBUTION OF PATIENTS WITH BSI (n=252)



Majority of patients with BSI were from Medical ICU(MICU) (34.1%) followed by Pulmonary critical care unit (PCCU) (23%), Surgery ICU (SICU) (19.2%), Stroke ICU (STICU) (9.1%), Trauma ICU (TICU) (7.5%), Neurosurgery ICU (NSICU) (7.1%).

TABLE 4: VARIOUS RISK FACTORS ASSOCIATED WITH THE PATIENTS WITH BSI

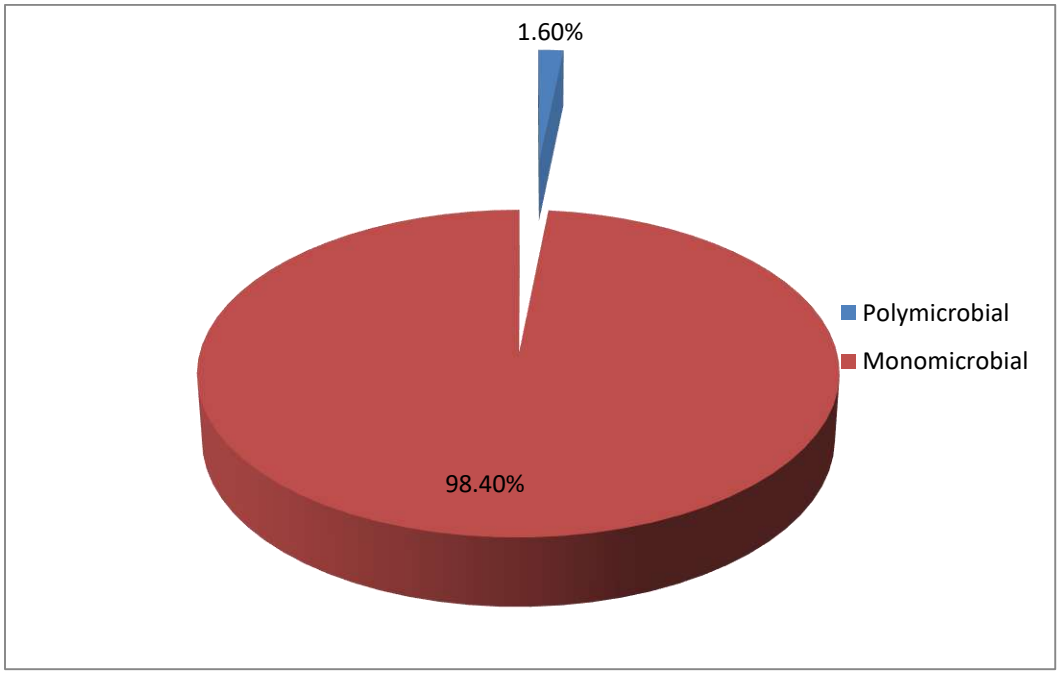
Risk factors	No of cases	%
Diabtes mellitus	84	33.3
Cardiovascular diseases	74	29.3
Ventilatory support	25	9.9
Dialysis	10	3.9

Out of 252 patients with BSI, 84 (33.3%) patients had diabetes mellitus, 29.3% had cardiovascular diseases, 25 (9.9%) were on ventilatory support (respiratory failure) 10(3.9%) were on dialysis.

TABLE 5: MONOMICROBIAL VS POLYMICROBIAL GROWTH IN BLOOD SAMPLES OF BSI (n=252)

Isolates	No. of samples	Percentage
Monomicrobial	248	98.4
Polymicrobial	4	1.6
Total	252	100

FIGURE 3: MONOMICROBIAL VS POLYMICROBIAL GROWTH IN BLOOD SAMPLES OF BSI (n=252)

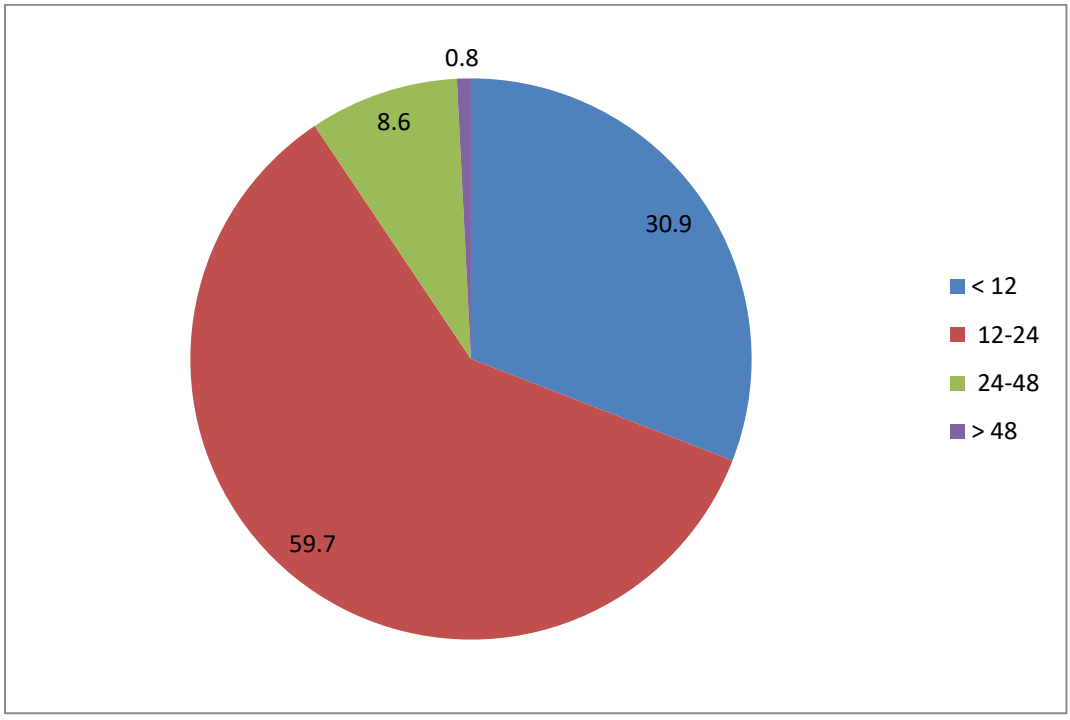


Monomicrobial growth was seen in 248(98.4%) blood samples of BSI and polymicrobial growth (two isolates each) was seen in 4(1.6%) blood samples of BSI. A total of 256 isolates were obtained from 252 blood samples.

TABLE 6: TIME TO POSITIVITY FOR VARIOUS ISOLATES (n=256)

TIME (HOURS)	TOTAL (n=256) (%)	Gram Negative (n=172)	Gram positive (n=58)	Yeast like Fungi (n=26)
< 12	79(30.9)	59	8	12
12-24	153(59.7)	100	40	13
24-48	22(8.6)	12	9	1
> 48	2(0.8)	1	1	0

FIGURE 4: TIME TO POSITIVITY FOR VARIOUS ISOLATES (n=256)



Time to positivity for most of isolates was 12-24 hours.

TABLE 7: DISTRIBUTION OF CASES ACCORDING TO LENGTH OF STAY IN HOSPITAL AND DEVELOPMENT OF BSI (n=252)

Time to BSI(days)	No. of cases	Percentage
< 3	27	10.7
3- 7	83	32.7
7-14	102	40.8
> 14	40	15.8
Total	252	100

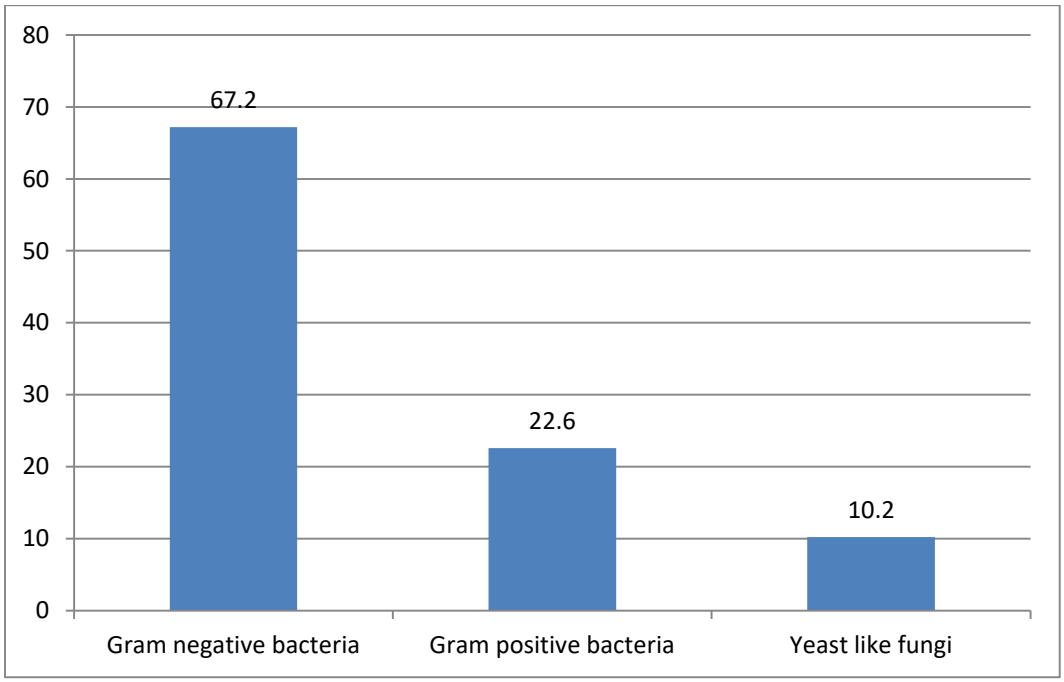
Most of BSI occur between 7-14 (40.8%) days followed by 3-7 days (32.7%), >14 days (15.8%).

27 (10.7%) were CA-BSI and 252(89.3%) were HA-BSI

TABLE 8: OVERALL DISTRIBUTION OF BLOOD CULTURE ISOLATES (n=256)

Isolates	No. of isolates	Percentage
Gram negative bacteria	172	67.2
Gram positive bacteria	58	22.6
Yeast like fungi	26	10.2
Total	256	100

FIGURE 5: OVERALL DISTRIBUTION OF BLOOD CULTURE ISOLATES (n=256)



Out of the 256 isolates, 172 (67.2%) were Gram negative bacteria, 58(22.6%) were Gram positive bacteria, 26(10.2%) were yeast like fungi.

TABLE 9: DISTRIBUTION OF BLOOD CULTURE ISOLATES (n=256)

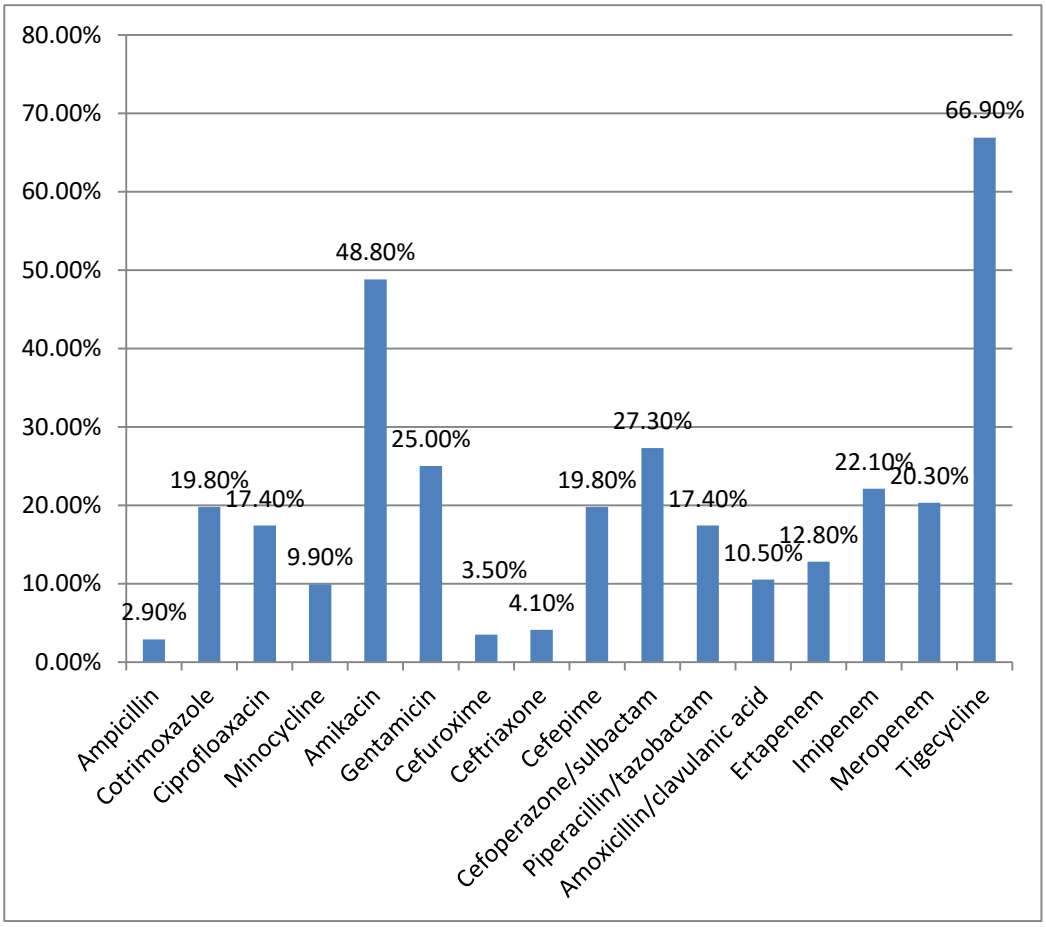
ORGANISM	No. of isolates	Percentage
Gram Negative Bacteria (n=172)		
Klebsiella pneumoniae	64	25
Acinetobacter baumannii	44	17.2
Escherichia coli	30	11.7
Pseudomonas aeruginosa	9	3.5
Stenotrophomonas maltophilia	5	1.9
Enterobacter cloacae	4	1.5
Acinetobacter lwoffii	3	1.2
Sphingomonas paucimobilis	3	1.2
Achromobacter xylosans	2	0.8
Salmonella typhi	2	0.8
Serratia marscenses	2	0.8
Burkholderia cepacia	1	0.4
Elizabethkingia meningoseptica	1	0.4
Proteus mirabilis	1	0.4
Pseudomonas stutzeri	1	0.4
Gram Positive Bacteria (n=58)		
Coagulase negative *Staphylococcus*	31	12.1
Staphylococcus aureus	18	7
Enterococcus faecium	9	3.5
Yeast like fungi (n=26)		
Candida albicans	9	3.5
Candida tropicalis	9	3.5
Candida famata	2	0.8
Candida parapsilosis	2	0.8
Candida auris	1	0.4
Candida gulliermondii	1	0.4
Candida krusei	1	0.4
Candida lusitaniae	1	0.4
Total	256	100

Coagulase negative *Staphylococcus* (CONS) were included after repeat isolation and clinical correlation

TABLE 10: ANTIMICROBIAL SUSCEPTIBILITY PATTERN OF GRAM NEGATIVE ISOLATES (n=172)

Antimicrobial agents	No. of isolates	Sensitivity
Ampicillin	5	2.9
Cotrimoxazole	34	19.8
Ciprofloaxacin	30	17.4
Minocycline	17	9.9
Amikacin	84	48.8
Gentamicin	43	20
Cefuroxime	6	3.5
Ceftriaxone	7	4.1
Cefepime	34	19.8
Cefoperazone/sulbactam	47	27.3
Piperacillin/tazobactam	30	17.4
Amoxicillin/clavulanic acid	18	10.5
Ertapenem	22	12.8
Imipenem	38	22.1
Meropenem	35	20.3
Tigecycline	115	66.9

FIGURE 6: ANTIMICROBIAL SUSCEPTIBILITY PATTERN OF GRAM NEGATIVE ISOLATES (n=172)

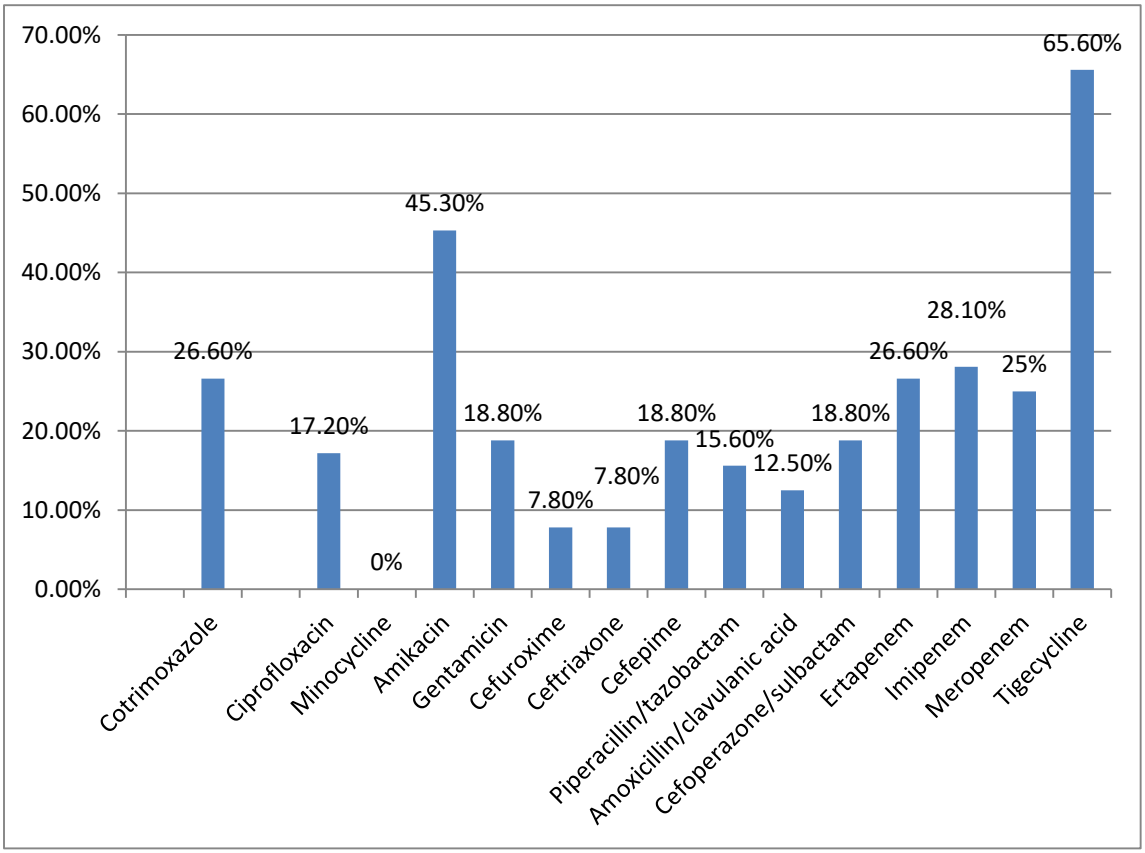


Gram negative isolates showed low susceptibility to ampicillin (2.9%), amoxyclavulanic(10.5%), ciprofloxacin(17.4%) ,piperacillin/tazobactam (17.4%), while susceptibility to gentamicin was (25.5%), cefoperazone/sulbactam (27.3%), amikacin was 48.8% . The isolates were highly susceptible to tigecycline (66.9%).

TABLE 11: ANTIMICROBIAL SUSCEPTIBILITY PATTERN OF COMMON GRAM NEGATIVE ISOLATES (n=172)

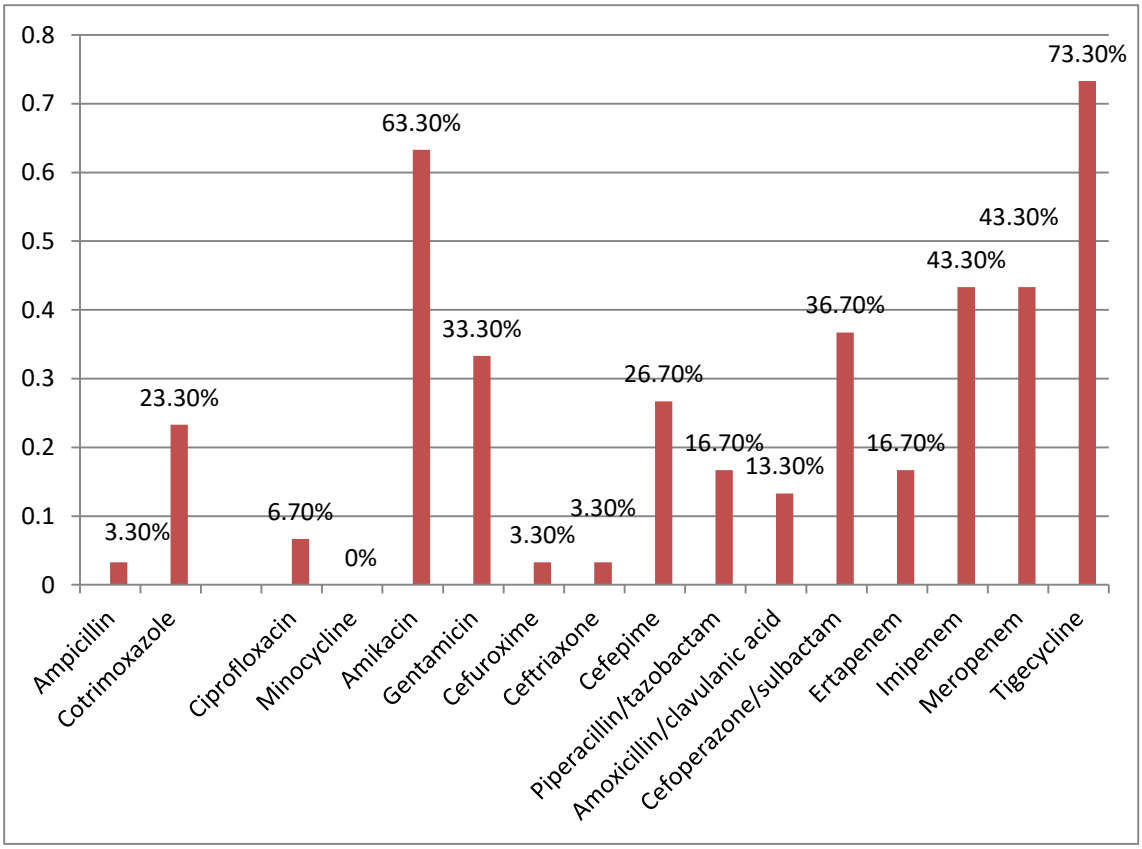
Antimicrobial agents	*Klebsiella pneumoniae* (n=64)	*Escherichia coli* (n=30)	*Acinetobacter baumannii* (n=44)
Ampicillin	-	1(3.3)	2(4.5)
Cotrimoxazole	17(26.6)	7(23.3)	4(9.1)
Levofloxacin	-	-	5(11.4)
Ciprofloxacin	11(17.2)	2(6.7)	5(11.4)
Minocycline	0(0)	0(0)	13(29.5)
Amikacin	29(45.3)	19(63.3)	15(34.1)
Gentamicin	12(18.8)	10(33.3)	7(15.9)
Cefuroxime	5(7.8)	1(3.3)	0(0)
Ceftriaxone	5(7.8)	1(3.3)	0(0)
Cefepime	12(18.8)	8(26.7)	1(2.3)
Piperacillin/tazobactam	10(15.6)	5(16.7)	3(6.8)
Amoxicillin/clavulanic acid	8(12.5)	4(13.3)	2(4.5)
Cefoperazone/sulbactam	12(18.8)	11(36.7)	8(18.2)
Ertapenem	17(26.6)	5(16.7)	0(0)
Imipenem	18(28.1)	13(43.3)	2(4.5)
Meropenem	16(25)	13(43.3)	2(4.5)
Tigecycline	42(65.6)	22(73.3)	35(79.5)

FIGURE 7: ANTIMICROBIAL SUSCEPTIBILITY PATTERN OF *KLEBSIELLA PNEUMONIAE* (n=64)



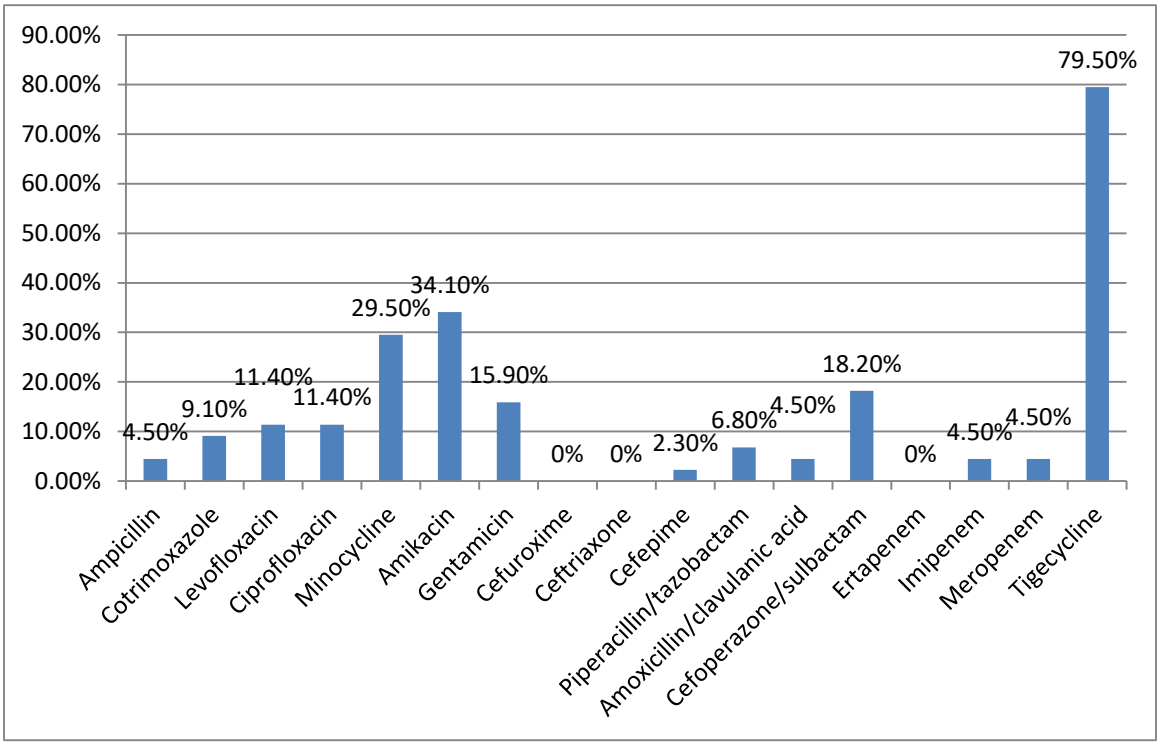
Klebsiella pneumoniae isolates were highly susceptibility to tigecycline (65.6%) and amikacin (45.3%). Susceptibility to carbapenem was 25 -30 % whereas low susceptibility was seen to cephalosporins and ciprofloxacin (17.2%).

FIGURE 8: ANTIMICROBIAL SUSCEPTIBILITY PATTERN OF *ESCHERICHIA COLI* (n=30)



73.3% isolates of *Escherichia* were susceptible to tigecycline followed by amikacin (63.3%), carbapenams (43-44%) while low susceptibility was seen to amoxyclav(13.3%) cephalosporins , amipicillin(3.3%).

FIGURE 9: ANTIMICROBIAL SUSCEPTIBILITY PATTERN OF *ACINETOBACTER BAUMANNII* (n=44)

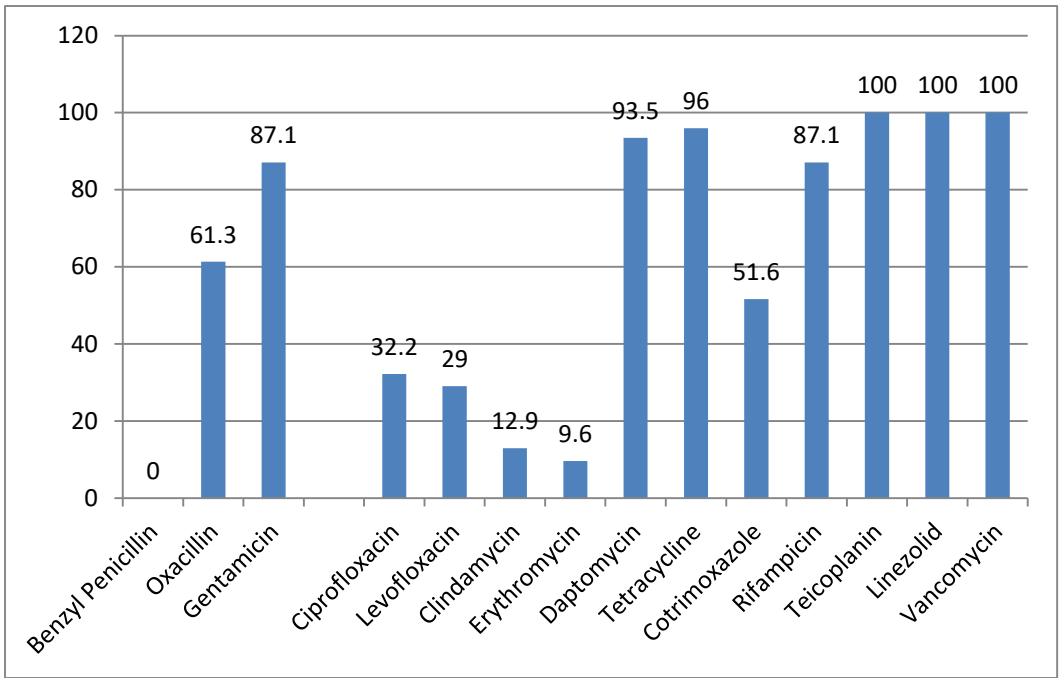


Acinetobacter baumannii was 79.5% susceptible to tigecycline , 34% to amikacin , 18% to cefoperazone/sulbactam while low susceptibility was seen to cotrimoxazole(9.1%), piperacillin/tazobactam(6.8%) and ampicillin(4.5%) .

TABLE 12: ANTIMICROBIAL SUSCEPTIBILITY PATTERN OF GRAM POSITIVE ISOLATES (n=58)

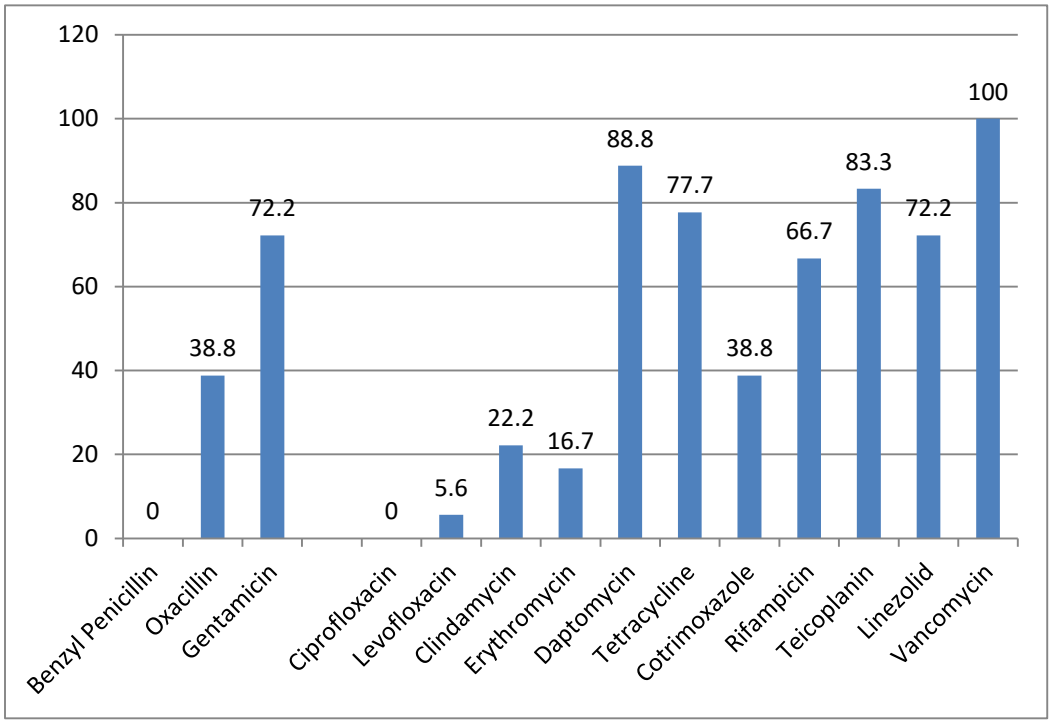
Antimicrobial agents	CONS (n=31)	*Staphylococcus aureus* (n=18)	*Enterococcus faecium* (n=9)
Benzyl Penicillin	0(0)	0(0)	0(0)
Oxacillin	19(61.3)	7(38.9)	0(0)
Gentamicin	27(87.1)	13(72.2)	1(11.1)
High level Streptomycin	-	-	1(11.1)
Ciprofloxacin	10(32.2)	0(0)	0(0)
Levofloxacin	9(29)	1(5.6)	0(0)
Clindamycin	4(12.9)	4(22.2)	-
Erythromycin	3(9.6)	3(16.7)	2(22.2)
Daptomycin	29(93.5)	16(88.8)	-
Tetracycline	30(96)	14(77.7)	4(44.4)
Cotrimoxazole	16(51.6)	7(38.8)	-
Rifampicin	27(87.1)	12(66.7)	-
Teicoplanin	31(100)	15(83.3)	6(66.7)
Vancomycin	31(100)	18(100)	5(55.6)
Linezolid	31(100)	13(72.2)	9(100)

FIGURE 10: ANTIMICROBIAL SUSCEPTIBILITY PATTERN OF CONS (n=31)



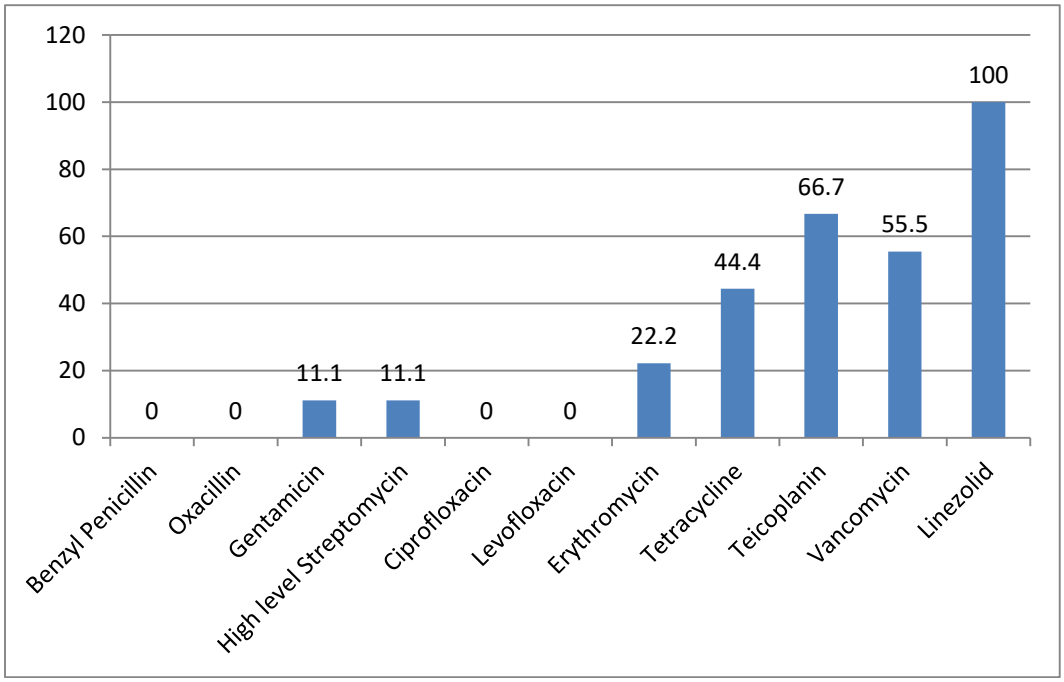
Among CONS (31) all isolates showed resistance to penicillin and 12 (38.7%) were Methicillin resistant (MRCONS). Low susceptibility was seen to erythromycin (9.6%), clindamycin (12.9%) and susceptibility to fluoroquinolones was almost 25%. All CONS were susceptible to vancomycin, teicoplanin and linezolid (100%).

FIGURE 11: ANTIMICROBIAL SUSCEPTIBILITY PATTERN OF *STAPHYLOCOCCUS AUREUS* (n=18)



Staphylococcus aureus (18): All isolates showed resistance to penicillin and ciprofloxacin while low susceptibility to erythromycin (16.7%), clindamycin (22.2%) cotrimoxazole (38.8%).11 isolates of *S.aureus* (61.1%) were methicillin resistant (MRSA). High sensitivity was seen to gentamicin (72.2%), linezolid (72.2%), tetracyclines (77.7%), teicoplanin (83.3%), daptomycin (88.8%) while 100% of isolates were susceptible to vancomycin.

FIGURE 12: ANTIMICROBIAL SUSCEPTIBILITY PATTERN OF *ENTEROCOCCUS FAECIUM* (n=9)

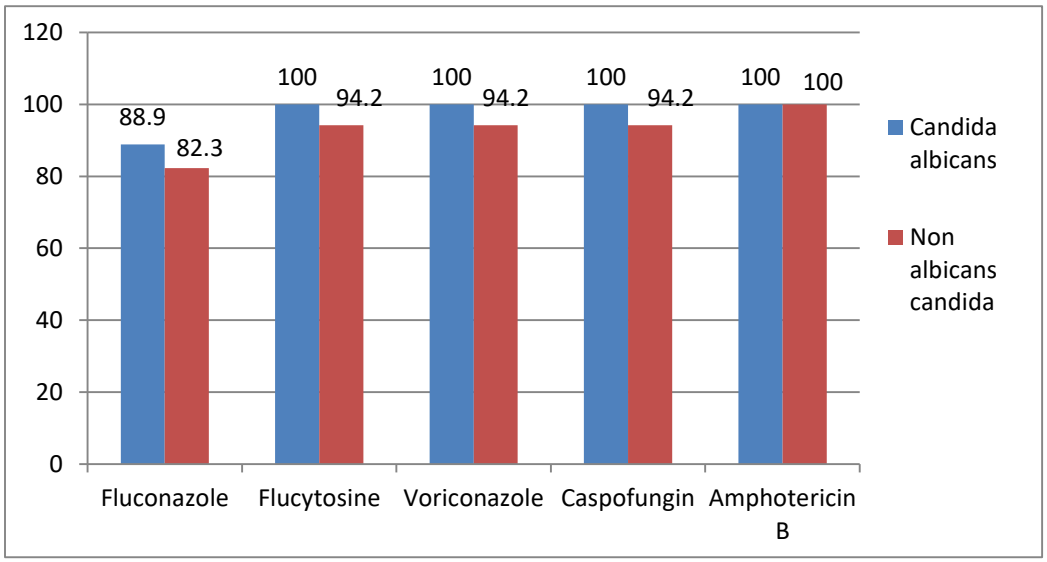


Enterococcus(9) : All isolates showed resistance to penicillin and fluoroquinolones while low susceptibility to gentamicin (11.1%) , cotrimoxazole(22.2%) , erythromycin (22.2%), clindamycin(22.2%) High sensitivity was seen to linezolid(100%), vancomycin(88.8%) . 66.6% were susceptible to teicoplanin ,55.5% to vancomycin . 4 out of 9(44.4%) isolates were vancomycin resistant(VRE).

TABLE 13: ANTIFUNGAL SUSCEPTIBILITY PATTERN OF FUNGAL ISOLATES (n=26)

Antifungal agents	*Candida albicans* (n=9)	Non *albicans Candida* (n=17)
Fluconazole	8(88.9)	14(82.3)
Flucytosine	9(100)	16(94.2)
Voriconazole	9(100)	16(94.2)
Caspofungin	9(100)	16(94.2)
Amphotericin B	9(100)	17(100)

FIGURE 13: ANTIFUNGAL SUSCEPTIBILITY PATTERN OF FUNGAL ISOLATES (n=26)

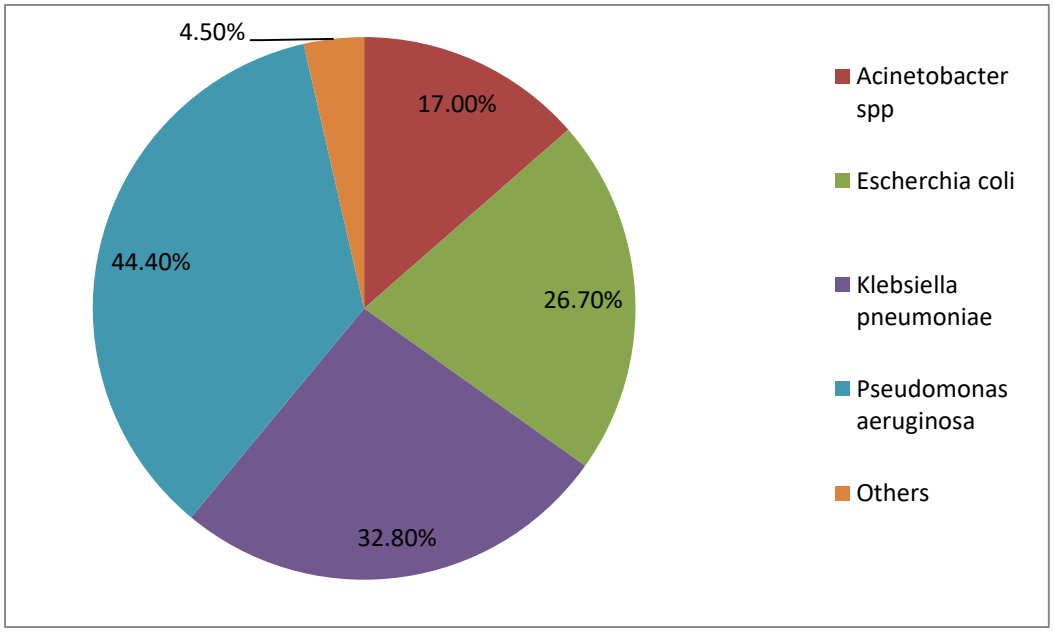


All *Candida albicans* (9) were susceptible to flucytosine, amphotericin B, caspofungin and voriconazole while susceptibility to fluconazole was 88.9%.Among the non *albicans Candida* (*C.tropicalis*, *C.famata*, *C.parapsilosis*, *C.auris*, *C.gulliermondii*, *C.krusei*, *C.lusitaniae*), susceptibility to fluconazole was 82.3%, flucytosine, voriconazole, caspofungin was 94.2% while susceptibility to amphotericin B was 100%.

TABLE 14: ESBL PRODUCING GRAM NEGATIVE ORGANISMS (n=172)

ORGANISMS	Total (n=172)	PROBABLE ESBL 91(53)	CONFIRMED ESBL 42(24.4)
Klebsiella pneumoniae	64	37(57.8)	21(32.8)
Acinetobacter spp	47	25(27.5)	8(17)
Escherichia coli	30	19(20.9)	8(26.7)
Pseudomonas spp.	9	5(40.6)	4(44.4)
Others	22	5(40.6)	1(4.5)

FIGURE 14: ESBL PRODUCING GRAM NEGATIVE ORGANISMS (n=172)

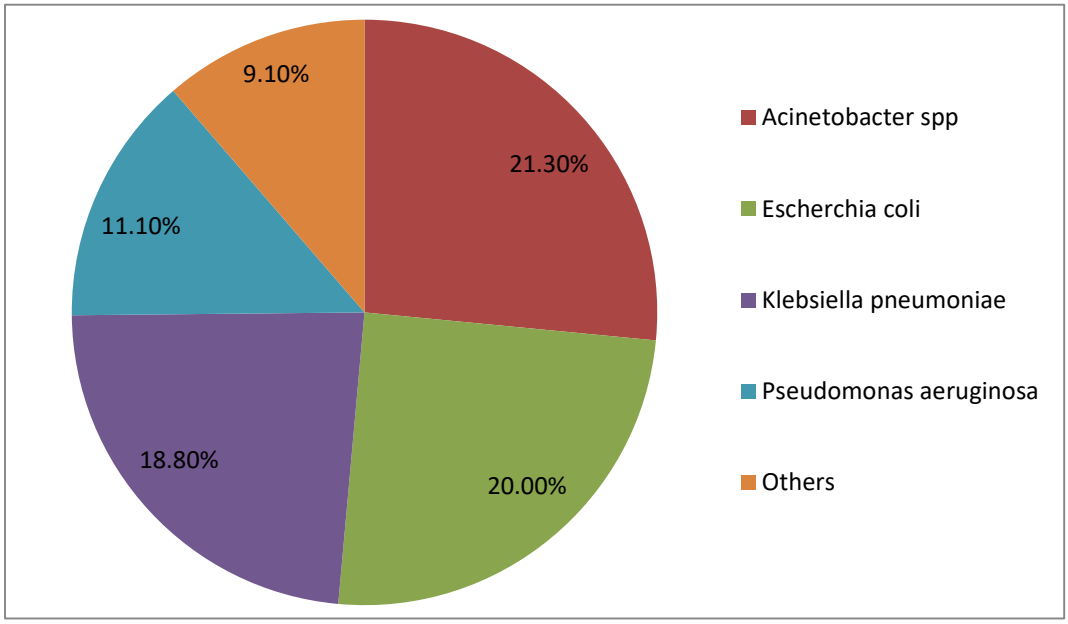


Out of 172 Gram negative isolates, 91(53%) were probable ESBL producers and 42(24.4%) were confirmed ESBL producers. 32.7% of *K. Pneumonia*, 17% of *Acinetobater* spp., 26.7% of *E.coli*, 44.4% of *Pseudomonas* spp. were confirmed ESBL producers.

TABLE 15: AmpC BETA LACTAMASE PRODUCING GRAM NEGATIVE ORGANISMS (n=172)

ORGANISM	Total(n=172)	PROBABLE AmpC 50(29)	CONFIRMED AmpC 31(18)
Klebsiella pneumoniae	64	20(31.3)	12(18.8)
Acinetobacter spp	47	17(36.2)	10(21.3)
Escherichia coli	30	10(33.3)	6(20)
Pseudomonas spp	9	1(11.1)	1(11.1)
Others	22	2(9.1)	2(9.1)

TABLE 15: AmpC BETA LACTAMASE PRODUCING GRAM NEGATIVE ORGANISMS (N=172)

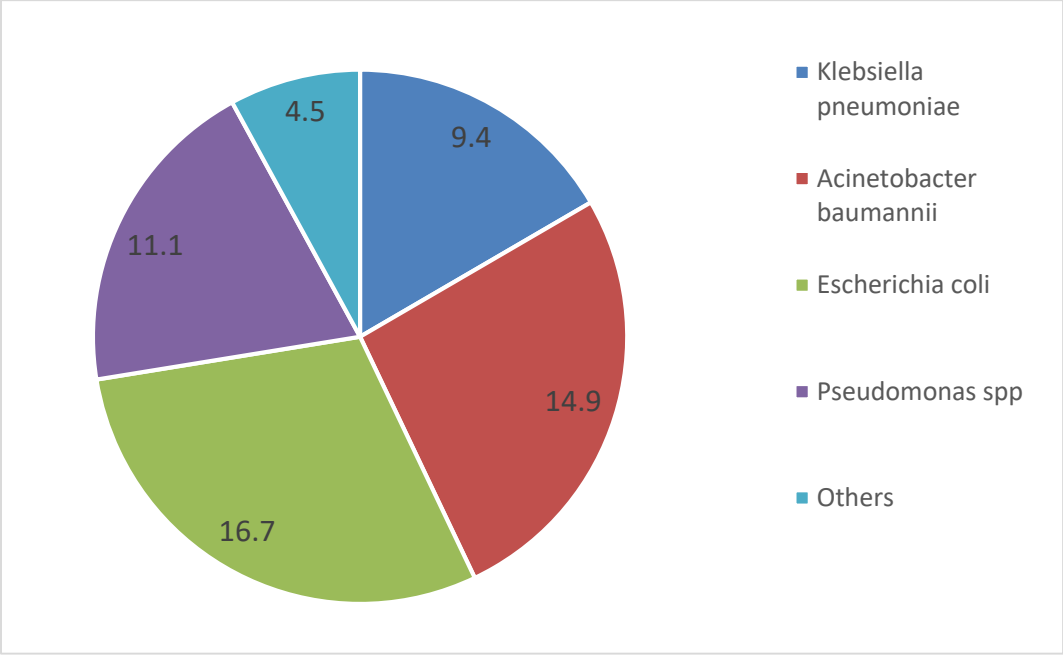


Out of 172 Gram negative isolates, 50(29%) were probable AmpC producers and 31(18%)were confirmed AmpC producers. 21.3% of *Acinetobacter* spp, 20% of *Escherichia coli*,18.8% of *Klebsiella* and 11.1% of *Pseudomonas* spp were confirmed AmpC producers.

TABLE 16: CARBAPENEMASES (MBL) PRODUCING GRAM NEGATIVE ORGANISMS (n=172)

ORGANISM	Total (n=172)	PROBABLE MBL 93(54)	CONFIRMED MBL 20(11.6)
Klebsiella pneumoniae	64	34(53.1)	6(9.4)
Acinetobacter baumannii	47	31(66)	7(14.9)
Escherichia coli	30	16(53.3)	5(16.7)
Pseudomonas spp	9	4(44.4)	1(11.1)
Others	22	8(36.4)	1(4.5)

FIGURE 16: CARBAPENEMASES (MBL) PRODUCING GRAM NEGATIVE ORGANISMS (n=172)

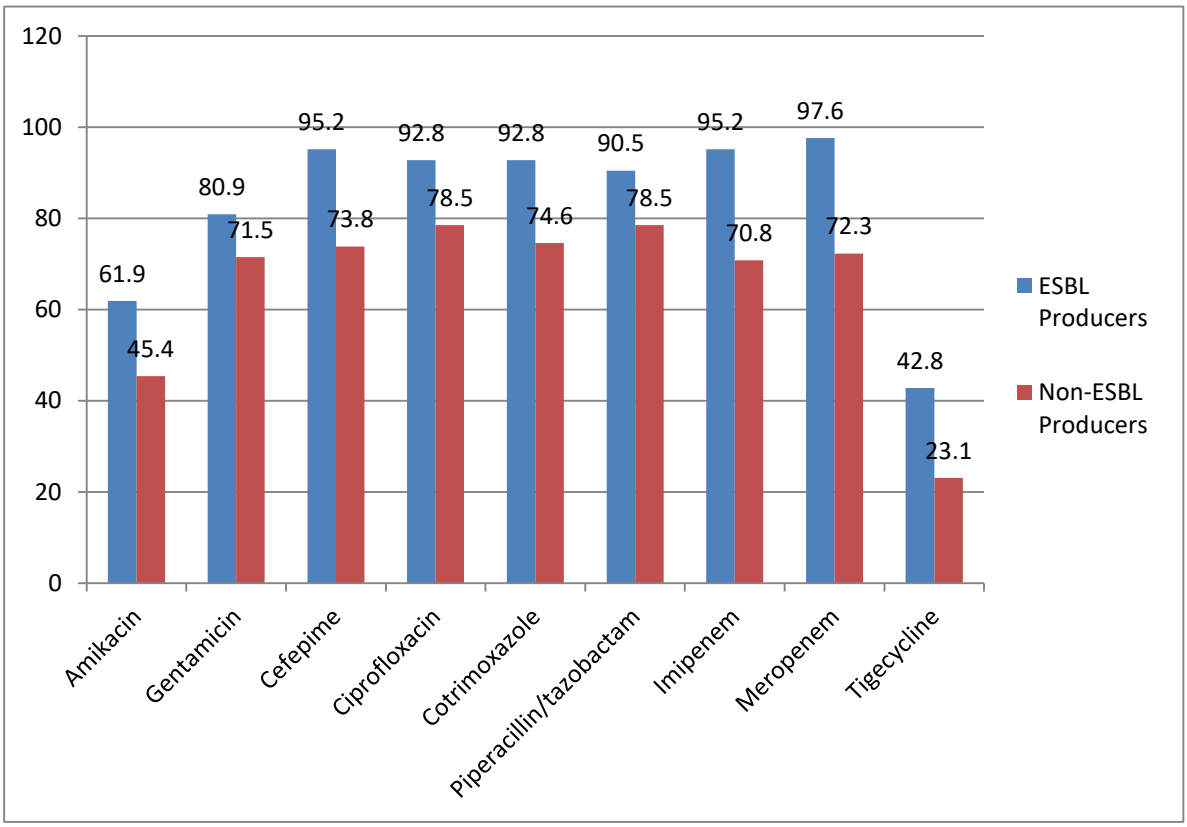


Out of 172 Gram negative isolates, 93(54%) were probable MBL producers and 20(11.6%) were confirmed MBL producers, 14.9% of *Acinetobacter* spp, 16.7% of *Escherichia coli*,9.4% of *Klebsiella pneumoniae* and 11.1% of *Pseudomonas* spp were confirmed MBL producers.

TABLE 17: COMPARISON OF ANTIMICROBIAL RESISTANCE PATTERN AMONG ESBL PRODUCING AND NON ESBL PRODUCING GRAM NEGATIVE ISOLATES (n=172)

ANTIMICROBIAL AGENTS	ESBL Producers 42(24.4)	Non-ESBL Producers 130 (75.6)	p-value
Amikacin	26(61.9)	59(45.4)	0.094
Gentamicin	34(80.9)	93(71.5)	0.367
Cefepime	40(95.2)	96(73.8)	0.009
Ciprofloxacin	39(92.8)	102(78.5)	0.086
Cotrimoxazole	39(92.8)	97(74.6)	0.030
Piperacillin/tazobactam	38(90.5)	102(78.5)	0.005
Imipenem	40(95.2)	92(70.8)	0.004
Meropenem	41(97.6)	94(72.3)	0.002
Tigecycline	18(42.8)	30(23.1)	0.018

FIGURE 17: COMPARISON OF ANTIMICROBIAL RESISTANCE PATTERN AMONG ESBL PRODUCING AND NON ESBL PRODUCING GRAM NEGATIVE ISOLATES (n=172)

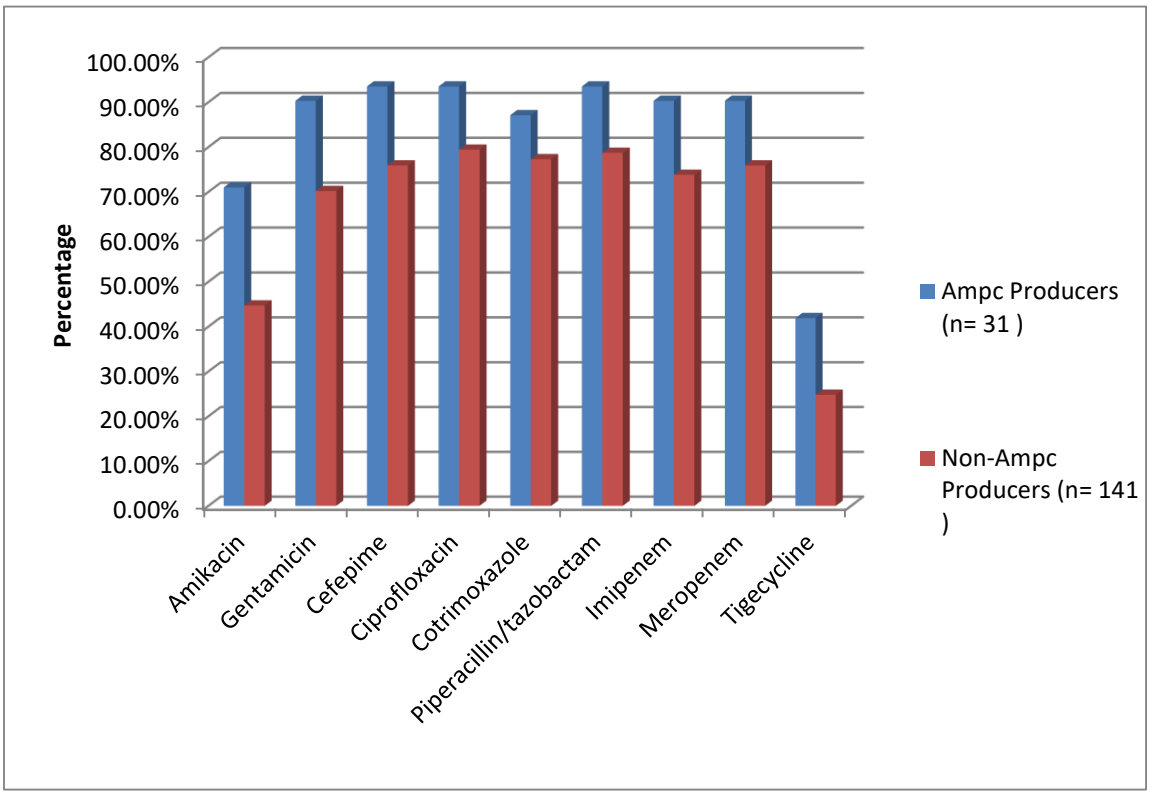


On comparing the resistance pattern in ESBL/non ESBL producers, significant difference in the resistant pattern was observed for aminoglycosides, cefepime, fluoroquinolones, cotrimoxazole, piperacillin/tazobactam, carbapenems and tigecycline. The difference in resistance was statistically significant ($p<0.05$)

TABLE 18: COMPARISON OF ANTIMICROBIAL RESISTANCE PATTERN AMONG AmpC PRODUCING AND NON AmpC PRODUCING GRAM NEGATIVE ISOLATES (n=172)

ANTIMICROBIAL AGENTS	AmpC Producers 31(18)	Non-AmpC Producers 141(82)	p-value
Amikacin	22(71)	63(44.7)	0.008
Gentamicin	28(90.3)	99(70.2)	0.021
Cefepime	29(93.5)	107(75.9)	0.029
Ciprofloxacin	29(93.5)	112(79.4)	0.064
Cotrimoxazole	27(87.1)	109(77.3)	0.225
Piperacillin/tazobactam	29(93.5)	111(78.7)	0.073
Imipenem	28(90.3)	104(73.8)	0.048
Meropenem	28(90.3)	107(75.9)	0.077
Tigecycline	13(41.9)	35(24.8)	0.054

FIGURE 18: COMPARISON OF ANTIMICROBIAL RESISTANCE PATTERN AMONG AmpC PRODUCING AND NON AmpC PRODUCING GRAM NEGATIVE ISOLATES (n=172)

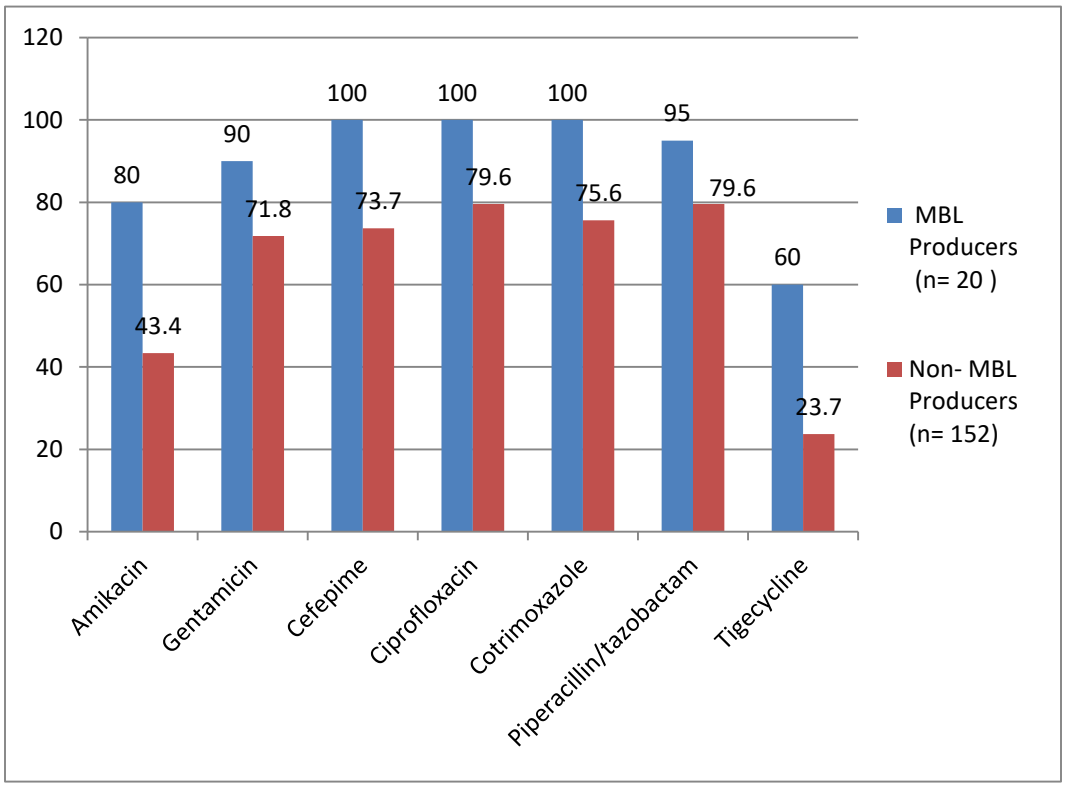


Amp C producers were highly resistant to gentamicin, cefepime, piperacillin/tazobactam, imipenem, meropenem and tigecycline than non-Amp C producers and the difference was statistically significant.($p<0.05$)

TABLE 19: COMPARISON OF ANTIMICROBIAL RESISTANCE PATTERN AMONG CARBAPENEMASE (MBL) PRODUCING AND NON MBL PRODUCING GRAM NEGATIVE ISOLATES (n=172)

Antimicrobial agents	MBL Producers 20 (11.6)	Non- MBL Producers 152(88.4)	P-value
Amikacin	16(80)	69(43.4)	0.009
Gentamicin	18(90)	109(71.8)	0.186
Cefepime	20(100)	112(73.7)	0.032
Ciprofloxacin	20(100)	121(79.6)	0.092
Cotrimoxazole	20(100)	115(75.6)	0.012
Piperacillin/tazobactam	19(95)	121(79.6)	0.254
Tigecycline	12(60)	36(23.7)	0.001

FIGURE 19: COMPARISON OF ANTIMICROBIAL RESISTANCE PATTERN AMONG CARBAPENEMASE (MBL) PRODUCING AND NON MBL PRODUCING GRAM NEGATIVE ISOLATES (n=172)

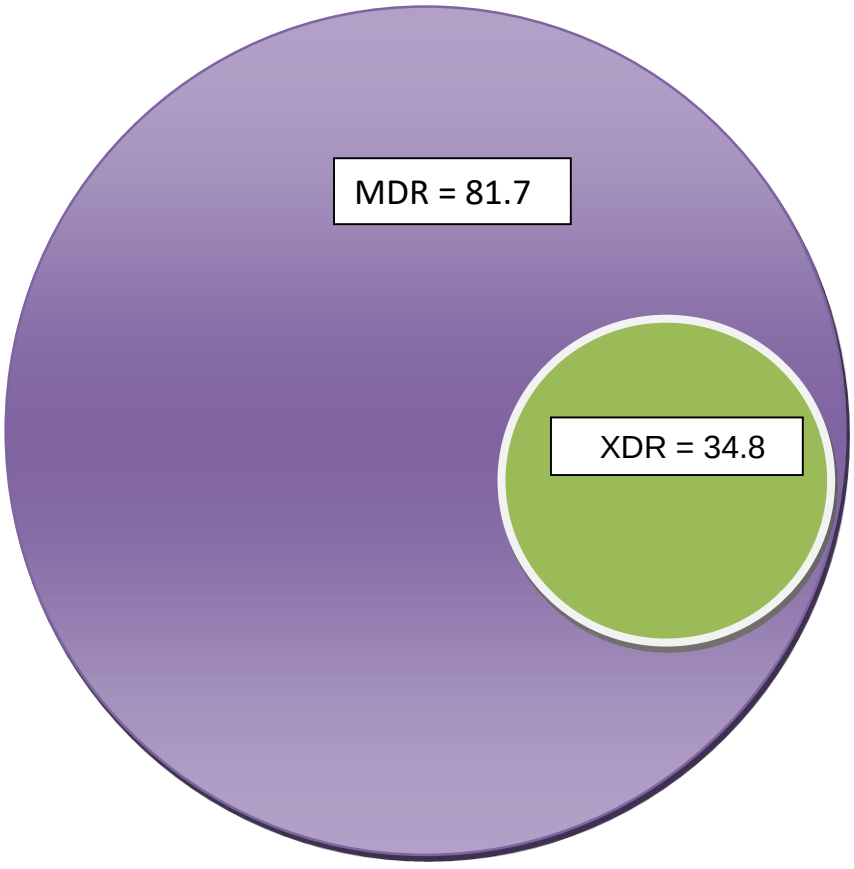


Carbapenemase producers showed higher resistance to amikacin, cotrimoxazole, cefepime and tigecycline than non carbapenemase producers and the difference was statistically significant ($p<0.05$)

TABLE 20: MDR, XDR AND PDR AMONG THE BACTERIAL ISOLATES (n=230)

Resistance pattern	No. of isolates(n=230)	Percentage
MDR	188	81.7
XDR	89	34.8
PDR	0	0

FIGURE 20: MDR, XDR AND PDR AMONG THE BACTERIAL ISOLATES (n=230)



Out of 230 bacterial isolates, 188 (81.7%) were multi drug resistant, 89 (34.8%) were extensively drug resistant.

TABLE 21: RESISTANCE PATTERN AMONG GRAM POSITIVE ISOLATES

Resistance pattern	No. of isolates(n)	Percentage
MRSA	11(18)	61.1
MRCONS	12(31)	38.7
VRE	4(9)	44.4

Out of 18 isolates of *Staphylococcus aureus* 11 (61.1%) were methicillin resistant (MRSA).

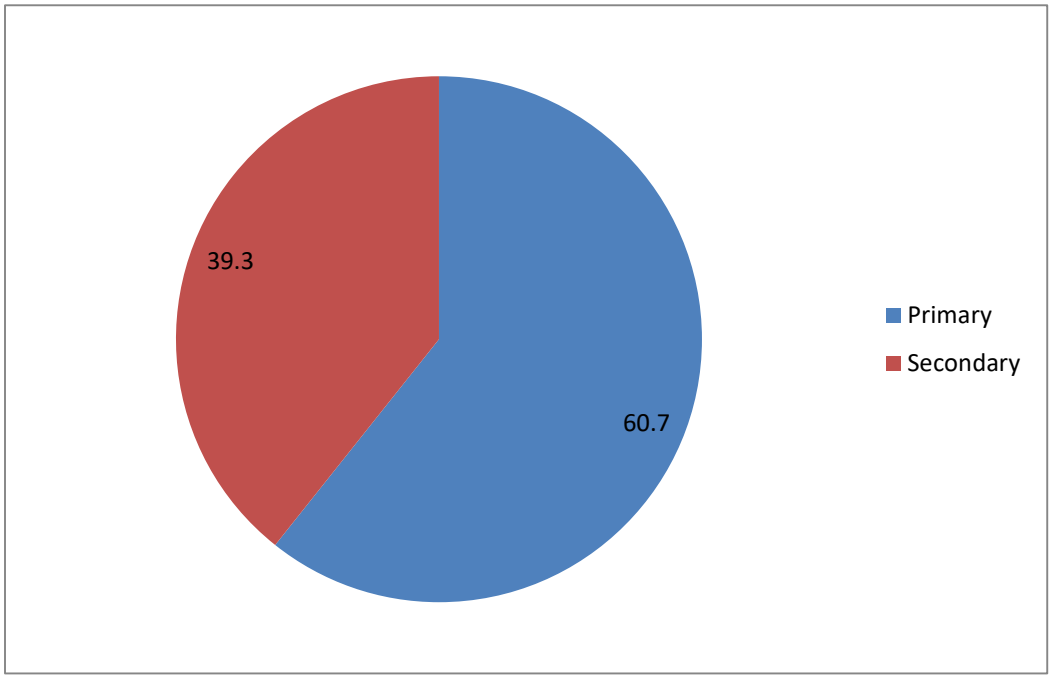
Out of 31 isolates of CONS 12(38.7%) were methicillin resistant (MRCONS).

Out of 9 isolates of *Enterococcus* 4(44.4%) were vancomycin resistant (VRE).

TABLE 22: SOURCE OF BLOODSTREAM INFECTION (n=252)

SOURCE OF INFECTION	Frequency	Percentage
Primary	153	60.7
Secondary	99	39.3

FIGURE 21: SOURCE OF BLOODSTREAM INFECTION (n=252)



60.7% of BSI were primary while 39.3% of BSI were secondary.

TABLE 23: SOURCE OF SECONDARY BLOODSTREAM INFECTION (n=252)

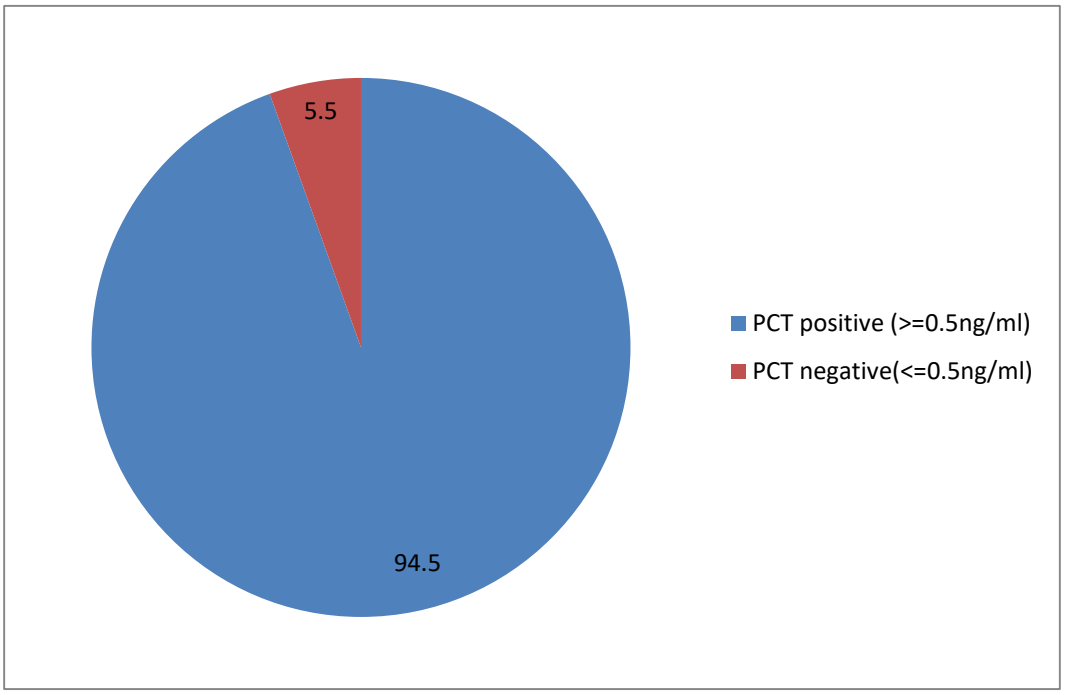
SOURCE OF INFECTION	Frequency	Percent
Respiratory tract infections	31	12.3
Urinary tract infection	25	9.9
Central line	12	4.8
Skin and soft tissue	9	3.6
Body fluids	6	2.4
Others	16	6.3
Total	99	39.3

Lower respiratory tract infections were found to be the most frequent source of BSI (12.3%), followed by the urinary tract infections (9.9%), central line (4.8%), skin and soft tissue infections (3.6%), body fluids (2.4%).

TABLE 24: CORRELATION OF PCT VALUES IN BLOOD STREAM INFECTION POSITIVE CASES (n=222)

	No of cases	Percentage
PCT positive (>=0.5ng/ml)	210	94.5
PCT negative(<=0.5ng/ml)	12	5.5

FIGURE 22: CORRELATION OF PCT VALUES IN BLOOD STREAM INFECTION POSITIVE CASES (n=222)



Out of 252 cases Procalcitonin(PCT) was received in 222 blood culture positive cases, PCT value was positive (>0.5ng/ml) in 94.5 % of cases and 5.5 % of cases were PCT negative(<0.5%).

TABLE 25: COMPARISON OF PCT VALUES AMONG VARIOUS ISOLATES

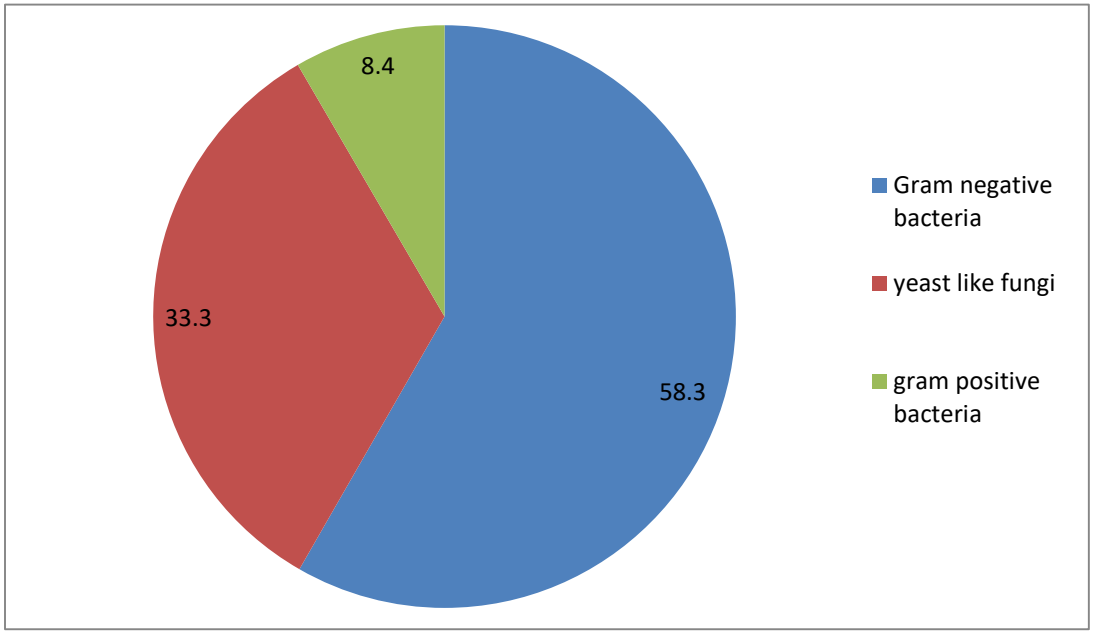
ORGANISM	PCT GROUP				Total
	< 0.5	0.5-2	2-9.9	> 10	
Gram negative bacteria					
Klebsiella pneumoniae	5	10	22	20	57
Acinetobacter baumannii	9	12	10	10	40
E.coli	4	3	4	14	25
Pseudomonas aeruginosa	1	2	0	2	5
Stenotrophomonas maltophilia	0	3	1	1	5
Enterobacter cloacae	2	0	1	1	4
Sphingomonas paucimobilis	1	1	1	0	3
Achromobacter xylosans	0	1	0	1	2
Acinetobacter lwoffii	1	0	0	0	1
Burkholderia cepacia	0	1	0	0	1
Serratia marscenses	1	0	1	0	2
Elizabethkingia meningoseptica	0	0	0	1	1
Pseudomonas stutzeri	0	1	0	0	1
Salmonella typhi	0	0	0	1	1
GRAM POSITIVE BACTERIA					
Staphylococcus aureus	0	5	3	9	17
Staphylococcus epidermidis	2	7	2	3	14
Staphylococcus haemolyticus	1	6	2	3	11
Staphylococcus hominis	1	1	0	0	2
Enterococcus faecium	1	4	1	2	8
YEAST LIKE FUNGI					
Candida albicans	2	2	2	2	8
Candida famata	2	0	0	0	2
Candida parapsilosis	2	0	0	0	2
Candida tropicalis	0	2	2	3	7
Candida gulliermondii	1	0	0	0	1
Candida krusei	0	1	0	0	1
Candida lusitaniae	0	0	1	0	1
Total	39	72	39	72	222

PCT levels were markedly greater for gram negatives than for gram positives

TABLE 26: OVERALL DISTRIBUTION OF CENTRAL LINE ASSOCIATED BLOOD STREAM INFECTION (CLABSI) (n=12)

ISOLATES	CLABSI(n=12)	
	No. of isolates	Percentage
GRAM NEGATIVE BACTERIA	7	58.3
YEAST LIKE FUNGI	4	33.3
GRAM POSITIVE BACTERIA	1	8.4
TOTAL	12	100

FIGURE 23: OVERALL DISTRIBUTION OF CENTRAL LINE ASSOCIATED BLOOD STREAM INFECTION (CLABSI) (n=12)



Out of total 12 CLABSI cases ,7(58.3%)were Gram negative bacteria , 4 (33.3%)were Yeast like fungi and 1(8.3%)was Gram positive bacteria.

TABLE 27: DISTRIBUTION OF CLABSI ISOLATES (n=12)

ORGANISM	CLABSI	
	No. of isolates	Percentage
GRAM NEGATIVE BACTERIA		
Klebsiella pneumoniae	4	33.3
Acinetobacter baumannii	1	8.4
Elizabethkingia meningoseptica	1	8.3
Serratia marscenses	1	8.3
YEAST LIKE FUNGI		
Candida tropicalis	2	16.8
Candida albicans	1	8.3
Candida parapsilosis	1	8.3
GRAM POSITIVE BACTERIA		
Enterococcus faecium	1	8.3
Total	12	100

Out of 12 CLABSI cases, most common organism isolated was *Klebsiella pneumoniae*, followed by *Candida tropicalis* followed by *Acinetobacter* baumanii.

TABLE 28: OUTCOME OF CLABSI CASES (n=12)

OUTCOME	No of cases	%
RECOVERED	8	66.6
DAMA	2	16.7
EXPIRED	2	16.7

Out of 12 CLABSI cases, 8(66.7%) recovered, 2(16.7%) were discharged against medical advice and 2 (16.7%) expired.

TABLE 29: BLOODSTREAM INFECTION RATES

Rate	Value
CLABSI (per 1000 central line days)	1.18
Incidence rate of BSI(per 1000 ICU days)	9.8
Attack rate (cumulative incidence rate) of BSI (%)	4.8

Total CLABSI cases-12, Total Central line days-10,170

Total BSI-252, Total no. of ICU days-25,714

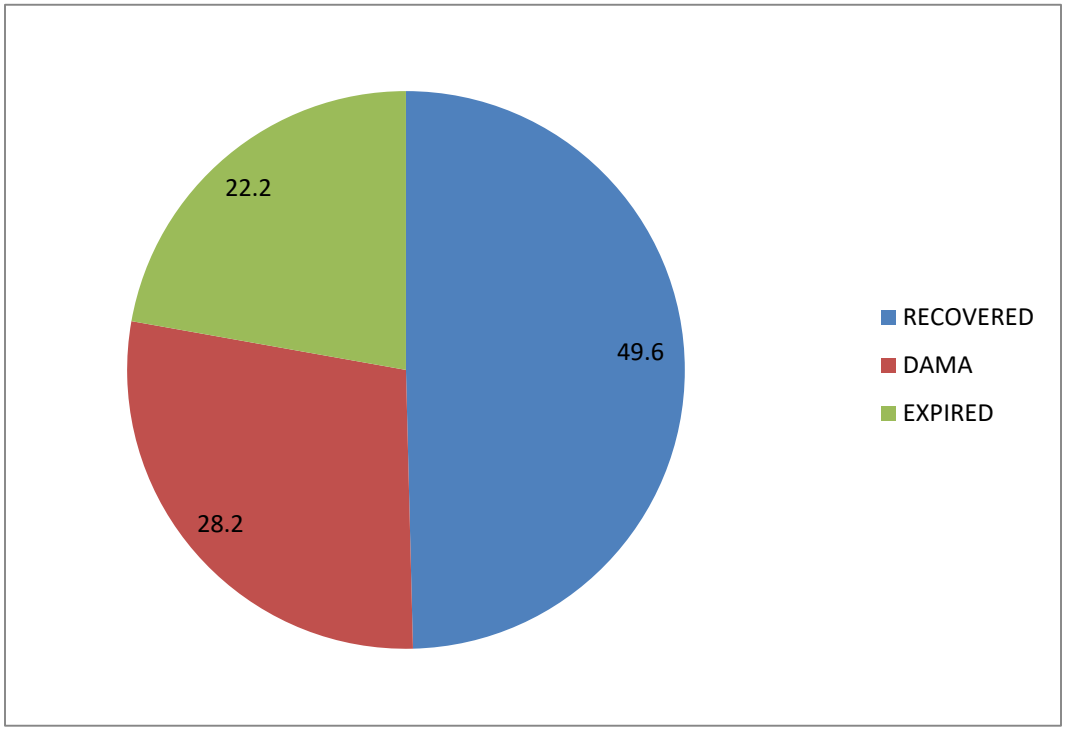
Total no. of ICU admissions -5296

The CLABSI rate was 1.18 per 1000 central line days. The incidence rate of BSI was 9.8 per 1000 ICU days while the attack rate (cumulative incidence rate) of BSI was 4.8%.

TABLE 30: OUTCOME OF PATIENTS WITH BSI (n=252)

OUTCOME	No of cases	%
RECOVERED	125	49.6
DAMA	71	28.2
EXPIRED	56	22.2

TABLE 24: OUTCOME OF PATIENTS WITH BSI (n=252)



Out of 252 BSI patients, 125(49.6%) recovered, 71(28.2%) were discharged against medical advice (DAMA) and 56 (22.2%) expired.

DISCUSSION

This prospective study was conducted over a period of one year (August1,2019-July 31,2020) in the department of Microbiology, DMCH, Ludhiana in which total 5296 patients admitted in the ICUs and total 2425 blood samples received for culture. These 2425 samples were received from 1291 patients (725 paired and 975 unpaired). Out of these 2425 blood samples received for culture 435 samples were positive out of which 350 samples were included for further study and rest were probable contaminants. These 350 samples were received from 252 patients, from which 256 bacterial and fungal isolates were obtained. For each patient, only one bloodstream infection episode and, for each episode, only the first samples were considered. In the case of two or more episodes observed in the same patient, only the first was considered. A bloodstream infectious episode was defined as a time-period associated with one or more blood cultures positive for the same organism/organisms.[73]

Bloodstream infections are important cause of morbidity and mortality, especially in the ICUs where the risk factor is quite high as patients in the ICUs are critically ill, immunocompromised. Presence of central venous catheters add on to the risk, as many times central venous catheters are inserted under urgent conditions and proper guidelines of insertion could not be followed. Moreover, many times, empirical treatment is started before the report of culture comes which add on to the resistance to antibiotics and also effects the outcome of the patient. This antimicrobial resistance is of greater threat now a days and is increasing day by day.

In our study, majority of bloodstream infections were seen in males (66.3%) and male to female ratio is 2:1. This is similar to a study made by Bhabhor Ullas et al the sex-wise prevalence of BSI were more in male 94 (54.33%) than female 79 (45.66%)[77] and in a study of Jan Muhammad Shaikh et al[78] (M-52.6% & F-47.4%), Christine Bonnal et al.[79] (M-60% & F-39.70%), Prowle et al.[80] (M-65.2% & F-34.84%) .

In the current study mean age of the patients having bloodstream infections was 49.7±15.7 years which was comparable with the study of Olgica Gajović et al[81] (mean age 40yrs) and in Dr. Venu Gopal et al.[82] (mean age 47). Our study showed that majority of cases were from Medical ICU (34.1%) followed by Pulmonary ICU (23%), Surgical ICU (19.2%), Stroke ICU (9.1%), Trauma ICU (7.5%),Neurosurgery ICU (7.1%).

We also studied various risk factors associated with blood stream infections other than central venous catheters. In our study 84 i.e 33.3% patients had diabetes mellitus, 74 (29.3%) had cardiovascular disease, 25 (9.9%) were on ventilator,10(3.9%) were on dialysis, this is comparable to the study made by Gupta V et al[32].

In our study majority of BSI occur within 7-14 days (40.8%) of hospital admission whereas in one of the studies BSI occurring within 8 days of hospital admission were maximum (76%).[69] In our study time to positivity for majority of the isolates were 12-24 hours (59.8%). 11% of BSI were CA-BSI and 89% were HA-BSI. This is comparable to a study made by Baharoon et al[42] where CA-BSI were 40% and HA-BSI were 60% and Friedman et al[14] where CA-BSI were 28% and HA-BSI were 72%.

In the present study, a total of 256 isolates were obtained from 252 blood samples of BSI. Monomicrobial growth was seen in 248(98.4%) samples and polymicrobial growth was (two isolates each) seen in 4(1.6%) culture positive samples. This is similar to results shown by Mathur et al[49] in their study in which out of 152 bacteremia episodes, 156 bacterial isolates were obtained, 148(97%) were monomicrobial and 4(3%) were polymicrobial.

Our study showed that out of the 256 isolates, 172 (67.2%) were Gram negative bacteria, 58 (22.6%) were Gram positive bacteria, 26(10.2%) were yeast like fungus thus showing that maximum bloodstream infections were caused by Gram negative organisms. This was in comparison with study made by Hoste et al[83] (39.7%) and Jordi Vallés et al[84] (42.2%) which showed that in there study maximum blood stream

infections were caused by Gram positive organisms(50%). Our data is similar with the study made by Mehta et al[48] Mathur et al[49] in which Gram negative organisms accounted for 71% and 80.96% of blood stream infections respectively. In our study 10.2% of blood stream infections were caused by *Candida* spp which is in comparison to the study made by Valles et al[84] where 4.4% of BSI were caused by *Candida* spp.

In our study among the Gram negative organisms *Klebsiella pneumoniae* was the most commonly isolated organism(25%) followed by *Acinetobacter baumannii* (17.2%) and *Escherichia coli*(11.7%). which was also seen in study made by Svenja J et al.(24.3%)[85] Various other studies also show similar findings reporting *K.peumoniae*, *E.coli* and *A.baumannii* as the most common Gram negative bacteria. A study made by Panahi et al[86] reported *Klebsiella* spp as the most common isolate(37%), followed by *Pseudomonas* spp. and *Acinetobacter* spp(15.8% each). This differs from studies by Mehta et al[48] in which *A.baumannii* and *Pseudomonas aeruginosa* were the commonest Gram negative isolates respectively. Other Gram negative organisms isolated in our study were *Pseudomonas, Stenotrophomonas, Enterobacter cloacae, Acinetobacter lwoffii, Sphingomonas paucomobilis, Achromobacter xylosans, Salmonella typhi, Serratia marscenses, Burkholderia cepacia, Elizabethkingia meningoseptica, Proteus mirabilis and Pseudomonas stutzeri.*

In our study CONS was the most common Gram positive organism isolated(12.1%) followed by *Staphylococcus aureus* (7%) and *Enterococcus faecium*(3.5%) ,this is similar to study made by Silvia Natoli et al[87] and Surinder et al[88] where CONS isolated were (13%) and (6.45%) respectively whereas in another study made by Shaaban H. Ahmed et al[89] and various other studies *Staphylococcus* (29.2%,49.5%) was most common Gram positive organism isolated followed by *Enterococcus*(7.4%,7.1%). *Candida albicans* (3.5%) was the most common yeast like fungus causing BSI in our study which was similar to few other studies.

Antibiotic resistance plays a crucial role in the outcome of the patient. Prescription of antibiotics before the reports of culture comes is adding on to the problem as drug resistance is increasing day by day and we are left with very few options.

In our study Gram negative isolates showed low susceptibility to ampicillin (2.9%), amoxyclavulanic (10.5%), ciprofloxacin (17.4%), piperacillin / tazobactam (17.4%), gentamicin (25.5%) cefoperazone / sulbactam (27.3%), while susceptibility to amikacin was 48.8%. The isolates were highly susceptible to tigecycline (67%) this is almost similar to various other studies done by R.B. Patwardhan et al, 17[90] S sager Faiz et al. 21[91] US Kamat et al[92]

In our study *Klebsiella pneumoniae* isolates were highly susceptible to tigecycline (65.6%) and amikacin (45.3%). Susceptibility to carbapenem was 25 -30 % whereas low susceptibility was seen to cephalosporins and ciprofloxacin (17-20%). This results are similar to the results of various other studies.[93]

In our study 73.3% isolates of *Escherichia coli* were susceptible to tigecycline followed by amikacin (63.3%), carbapenams (43-44%) while low susceptibility was seen to amoxyclav(13.3%) cephalosporins, amipicillin(3.3%). This results are in accordance with the study by Gupta et al.[94]

In our study, 79.5% isolates of *Acinetobacter baumannii* were susceptible to tigecycline, 34% to amikacin, 18% to cefoperazone/sulbactam while low susceptibility was seen to ampicillin (4.5%), piperacillin/tazobactam (6.8%) and cotrimoxazole (9.1%). Bayram and Balci from Turkey[95] reported almost similar sensitivity pattern to various antimicrobials.

In our study all isolates of *Staphylococcus aureus* showed resistance to penicillin and ciprofloxacin while susceptibility to erythromycin (16.7%), clindamycin (22.2%), cotrimoxazole (38.8%) was seen. 61.1% were methicillin resistant (MRSA). High sensitivity was seen to gentamicin

(72.2%), linezolid (72.2%), tetracyclines (77.7%), teicoplanin (83.3%), daptomycin (88.8%) and 100% isolates were vancomycin sensitive. Among CONS all isolates showed resistance to penicillin and 38.7% were Methicillin resistant (MRCONS). Low susceptibility was seen to erythromycin (9.6%), clindamycin (12.9%) and susceptibility to fluoroquinolones was almost 25%. All CONS were susceptible to vancomycin, teicoplanin and linezolid (100%) which is comparable with similar study of R.B. Patwardhan et al,[90] . In our study, 61.1 % of *Staphylococcus aureus* were MRSA which was almost similar to various other studies where MRSA was between 75.6%-85.7%.[92]

In our study all isolates of *Enterococcus* showed resistance to penicillin and fluoroquinolones while low susceptibility to gentamicin (11.1%), cotrimoxazole (22.2%), erythromycin (22.2%), clindamycin (22.2%). High susceptibility was seen to vancomycin (55.6%), teicoplanin (66.6%), and 100% were susceptible to linezolid. 4 out of 9(44.4%) isolates were Vancomycin resistant (VRE).Garg et al[96] reported 16.6% of the *Enterococci* isolates to be vancomycin resistant while in a study made by Orsini et al[85] and Gupta et al[93], 66.7% and 78.3% isolates were vancomycin resistant respectively. All *Candida albicans* (9) were susceptible to flucytosine, amphotericin B , caspofungin and voriconazole while susceptibility to fluconazole was 88.9%.Among the non *albicans Candida* (*C.tropicalis, C.famata, C.parapsilosis, C.auris, C.gulliermondii, C.krusei, C.lusitaniae*), susceptibility to fluconazole was82.3%, flucytosine, voriconazole, caspofungin was 94.2% while susceptibility to amphotericin B was 100%.

In our study out of 172 Gram negative isolates, 42 (24.4%) isolates were confirmed ESBL producers. 32.8% of *Klebsiella* , 26.7% of *Escherichia coli*, 17% of *Acinetobacter* spp and 44.4% of *Pseudomonas* spp. were ESBL producers whereas in various other studies (40-66.7%) of *Klebsiella pneumoniae* and 41-63.6% of *Escherichia coli* were ESBL producers.[97, 98]

In our study AmpC production was seen in 31 out of 172(18%)Gram negative isolates , this is similar to 14.8% and 22% of the AmpC producers in various other studies.[64] In our study 21.3% of *Acinetobacter* , 20% of *Escherichia coli*,18.8% of *Klebsiella* and 11.1% of *Pseudomonas* spp were confirmed AmpC producers this is as compared to study done by Subha et al[99] in which maximum AmpC production was seen in *Klebsiella* (24.1%) and *E.coli*(37%).

MBL/KPC(Carbapenemase) production was seen in 20 out of 172(11.6%) Gram negative isolates in our study with maximum production seen in *Escherichia coli* (16.9%) followed by *Acinetobacter baumannii* (14.7%).These resistance patterns are mainly due to heavy antibiotic use and increasing antibiotic resistance.

On comparing the resistance pattern in ESBL/non-ESBL producers, ESBL producers were resistant to aminoglycosides, cefepime, fluoroquinolones, cotrimoxazole, piperacillin/tazobactam, carbapenems and tigecycline. The difference in resistance was statistically significant. Amp C producers were highly resistant to gentamicin, cefepime, piperacillin/tazobactam, imipenem, meropenem and tigecycline and the difference was statistically significant. Carbapenemase producers showed higher resistance to amikacin, cotrimoxazole, cefepime and tigecycline than non carbapenemase producers and the difference was statistically significant.

In our study, out of 230 bacterial isolates,188 isolates i.e 81.7% were multidrug resistant, 89 isolates i.e 34.8% were extensively drug resistant and in our study no isolate was pandrug resistant, this is in comparison to other studies where 34.2% and 73.9% isolates were multi drug resistant.[88, 100]

In the present study, primary bacteraemia was seen in 153 out of 252 BSI i.e 60.7% whereas secondary bacteraemia was seen in 99 BSI i.e 39.3%. This rate is almost similar to rate (32% and 37%)of secondary bacteraemia reported by Wisplinghoff et al[59] and Mathur et at.[49] In our

study lower respiratory tract infections were found to be the most frequent source of BSI (12.3%), followed by urinary tract infections (9.9%), central line infections (4.8%), skin and soft tissue infections (3.6%),body fluids infections(2.4%). Various other studies also showed that the lower respiratory tract was the most common source of BSI[55] whereas studies by Diekema et al[101] and Weinstein et al[102] reported intravenous catheter as the most common source.

In our study PCT (procalcitonin) was received for 222 patients out of 252 patients and PCT value was positive (>0.5ng/ml) in 210 cases (94.5%) and was negative (<0.5ng/ml) in 12(5.5%) cases and out of 210,35.1% cases have milder sepsis(PCT 0.5-2ng/ml), 23.4% cases have moderate sepsis(2-9.9 ng/ml), 36% have severe sepsis(>10ng/ml). The highest mean PCT value was seen in infections with *Klebsiella pneumoniae* followed by *Acinetobacter baumannii*, *Escherichia coli* and there PCT values were markedely greater(>10).This is similar to study done by Charles et al. [103], found that serum PCT levels were markedly greater for Gram-negatives than for Gram-positives.

In our study, total central line associated blood stream infection(CLABSI) cases were 12.Out of total 12 CLABSI cases ,7(58.3%)were gram negative bacteria , 4 (33.3%)were yeast like fungi and 1(8.3%)was gram positive bacteria. Out of 12, 4 isolates were of *Klebsiella pneumoniae*, 2 were of *Candida tropicalis*, 1 each of *Acinetobacter baumannii*, *Candida albicans*, *Candida parapsilosis, Elizabethkingia meningoseptica, Enterococcus faecium, Serratia marscenses*. This was similar to other study in which Gram negative were common organism isolated from CLABSI cases (79.5%) followed by Gram positive (10%).[21] and also *Klebsiella* was the most common organism isolated. Rate of CLABSI in our study was 1.18 per 1000 central line days. This is quite less than one other study published in IJMM made by Singhal Tanu et al[21] in which CLABSI rate was 5/1000 central line days and almost similar to one more study in which rate was 0.83/1000 central line days[104]. Out of 12

CLABSI cases, 8 were recovered, 2 were discharged against medical advice (DAMA) and 2 were expired.

In our study total CLABSI cases were 12 and total central line days were 10,170 thus the CLABSI rate was 1.18/ 1000 central line days which was similar to CRBSI rates in studies by Cheewinmethasiri J[105] et al(1.3/1000central line days) and Hajjej Z et al(2.4/1000central line days)[106]. The incidence rate of BSI was 9.8/ 1000 ICU days while the attack rate (cumulative incidence rate) of BSI was 4.8% which was similar to that reported from various other studies where it was found to be between 3.2%-6.8%.[107, 108]

In our study, 125(49.6%) patients with BSI recovered and 71(28.2%) were discharged against medical advice and 56(22.2%) expired during hospital stay. A crude mortality rate of 24% was also reported by Diekema et al.[101] Males outnumbered the females among the expired patients. Only 20% of expired patients had received adequate antibiotic therapy while 98% of those who survived received adequate therapy. Similarly, in a study done by Diekama et al showed 97% of survived patients had received adequate therapy.[101]

SUMMARY

- The present study entitled “Blood stream infections in ICUs and their association with central venous catheters” was conducted in the department of Microbiology and various ICUs at Dayanand Medical College and Hospital, Ludhiana. A total of 5296 patients were admitted in various ICUs and 2425 blood samples were received for culture. These 2425 samples were received from 1291 patients (725 paired and 975 unpaired), Out of these 2425 blood samples received for culture 435 samples were positive out of which 350 samples were included for further study and rest were probable contaminants. These 350 samples were obtained from 252 patients (104 paired and 142 unpaired) and from these 252 patients, 256 bacterial and fungal isolates were obtained which were further characterized and their association with central venous catheters and other risk factors was studied.
- Majority of patients with BSI were in the age group of 51-60 years (28.6%), followed by patients aged 61-70years (16.3%).The average age of the patients enrolled was 49.7±15.7 years.
- Majority of patients with BSI were males (66.3%) as compared to females (33.7%).
- Majority of patients with BSI were from Medical ICU (34.1%).
- Out of 252 patients, 84 (33.3%) patients had diabetes mellitus, 29.3% had cardiovascular disease, 25 (9.9%) were on ventilatory support (respiratory failure), 10 (3.9%) were on dialysis.
- Monomicrobial growth was seen in 248(98.4%) blood samples and polymicrobial growth (two isolates in each case) was seen in 4(1.6%) blood samples of BSI.
- Time to positivity for most of isolates was 12-24 hours (59.8%).
- Most of BSI occur between 7-14(40.8%) days followed by 3-7 days (32.7%), >14 days (15.8%).
- Out of 252 BSI, 27(11%) were CA-BSI and 225(89%) were HA-BSI.

- Out of the 256 isolates, 172 (67.2%) were Gram negative bacteria, 58 (22.7%) were Gram positive bacteria, 26(10.2%) were yeast like fungi.
- Overall the most common organism isolated was *Klebsiella pneumoniae*(25%) followed by *Acinetobacter baumannii* (17.2%), CONS (12.1%), *Escherichia coli* (11.7%) and *Candida* spp (10.2%).
- Among the Gram negative isolates, *Klebsiella pneumoniae* (25%) was the commonest isolate followed by *Acinetobacter baumannii* (17.2%), and *Escherichia coli* (11.7%).CONS (12.1%) were the most common Gram positive isolates. *Candida albicans* (3.5%) were most common yeast like fungi isolated.
- Overall Gram negative isolates were highly susceptible to tigecycline (67%), susceptibility to amikacin was 48.8%, cefoperazone/sulbactam (27.3%), gentamicin (25%), ciprofloxacin (17.4%), piperacillin/tazobactam (17.4%). Amoxyclavulanic (10.5%) and almost 3 % isolates were susceptible to ampicillin.
- Majority of Gram positive isolates were highly susceptible to linezolid, daptomycin, teicoplanin and rifampicin (70-98%).All isolates of *Staphylococcus* were susceptible to vancomycin. Low susceptibility was seen to cotrimoxazole, oxacillin, fluoroquinolones and clindamycin. All the Gram positive isolates were resistant to penicillin.
- Among CONS, 38.7% were MRCONS and among *S.aureus* 61.1% were MRSA.
- Out of 9 *Enterococcal* isolates, 4 (44.4%) were VRE.
- All *Candida albicans* (9) were susceptible to flucytosine , amphotericin B , caspofungin and voriconazole while susceptibility to fluconazole was 88.9%. Among the non albicans *Candida* (*C.tropicalis*, *C.famata*, *C.parapsilosis*, *C.auris*, *C.gulliermondii*, *C.krusei*, *C.lusitaniae*), susceptibility to fluconazole was 82.3%, flucytosine, voriconazole, caspofungin was 94.2% while susceptibility to amphotericin B was 100%.
- Out of 172 Gram negative isolates, 91 (52.9%) were probable ESBL producers and 42 (24.4%) were confirmed ESBL producers. 32.7% of

Klebsiella pneumoniae, 17% of *Acinetobater* spp., 26.7% of *Escherichia coli*, 44.4% of *Pseudomonas* spp. were confirmed ESBL producers.

- Out of 172 Gram negative isolates, 50 (29%) were probable AmpC producers and 31 (18%) were confirmed AmpC producers. 21.3% of *Acinetobacter* spp, 20% of *Escherichia coli*,18.8% of *Klebsiella pneumoniae* and 11.1% of *Pseudomonas* spp were confirmed AmpC producers.
- Out of 172 Gram negative isolates, 93 (54%) were probable MBL producers and 20 (11.6%) were confirmed MBL producers, 14.9% of *Acinetobacter* spp, 16.7% of *Escherichia coli*, 9.4% of *Klebsiella pneumoniae* and 11.1% of *Pseudomonas* spp were confirmed MBL producers.
- On comparing the resistance pattern in ESBL/non ESBL producers, significant difference in the resistant pattern was observed for aminoglycosides, cefepime, fluoroquinolones, cotrimoxazole, piperacillin/tazobactam, carbapenems and tigecycline. The difference in resistance was statistically significant ($p<0.05$)
- Amp C producers were highly resistant to gentamicin, cefepime, piperacillin/tazobactam ,imipenem, meropenem and tigecycline than non AmpC producers. The difference in resistance was statistically significant ($p<0.05$)
- Carbapenemase(MBL/KPC) producers showed higher resistance to amikacin, cotrimoxazole, cefepime and tigecycline than non carbapenemase producers and the difference was statistically significant.($p<0.05$)
- Out of 230 bacterial isolates, 188 (81.7%) were multi drug resistant, 89 (34.8%) were extensively drug resistant.
- A secondary source could be established in 99(39%) BSI, while primary bacteremia was seen in 153 (61%).
- Lower respiratory tract infections were found to be the most frequent source of BSI (12.3%), followed by the urinary tract infections (9.9%), central line (4.8%), skin and soft tissue infections (3.6%), body fluids (2.4%).

- Out of 252 blood culture positive cases Procalcitonin(PCT) was received in 222 cases, PCT value was positive (>0.5ng/ml) in 94.5 % cases and 5.4 % cases were PCT negative(<0.5%).
- Based on PCT score, *Klebsiella pneumonia* was the most common organism causing severe sepsis (PCT value>10) followed by *Acinetobacter* ,*Escherichia coli* and *Staphylococcus aureus*. PCT levels were markedly greater for gram negatives than for gram positives.
- Out of total 12 CLABSI cases ,7(58.3%)were Gram negative bacteria , 4 (33.3%)were Yeast like fungi and 1(8.4%)was Gram positive bacteria.
- Out of 12 CLABSI cases, most common organism isolated was *Klebsiella* followed by *Candida tropicalis* followed by *Acinetobacter*.
- Out of these 12 CLABSI cases, 8(66.7%) patients recovered, 2(16.7%) were DAMA and 2(16.7%) expired.
- CLABSI rate was 1.18 per 1000 central line days.
- Incidence rate of BSI was 9.8 per 1000 ICU days.
- Attack rate (cumulative incidence rate) of BSI was 4.8%.
- Out of 252 BSI patients, 125(49.6%) recovered, 71(28.2%) were discharged against medical advice (DAMA) and 56 (22.2%) expired during hospital stay, mortality was slightly higher in patients having BSI with MDR or XDR isolates than those with non MDR isolates.

CONCLUSION

Bloodstream infections are major cause of morbidity and mortality especially in ICUs as patients admitted in the ICUs are sick, immunocompromised. Out of 252 blood culture positive patients, majority were reported from MICU (34.1%). Bloodstream infections with Gram negative organisms (67.2%) were more than with Gram positive organisms (22.7%) or yeast like fungi (10.2%). Gram negative isolates were highly susceptible to tigecycline whereas they were less susceptible to carbapenems, cephalosporins and fluoroquinolones. Most of the Gram positive organisms were sensitive to linezolid, daptomycin, vancomycin and teicoplanin whereas they were resistant to penicillin. Most of the *Candida* species were susceptible to antifungals like fluconazole, flucytosine, voriconazole, amphotericin b, caspofungin. Among CONS, 38.7% were MRCONS and among *S.aureus* 61.1% were MRSA. Out of 9 *Enterococcal* isolates, 4 (44.4%) were VRE. Among Gram negative isolates, 24.4%, 18%, 14% isolates were ESBL, AmpC and carbapenemase (MBL/KPC) producers respectively. Among the bacterial isolates, 81.7%, 34.8% were MDR, XDR and no isolate was PDR.

61% were primary BSI while 39% were secondary BSI. Most common source of secondary BSI was lower respiratory tract infections (12.3%). Maximum number of BSI occur within 7-14 days of hospital admission. CLABSI was seen in 12 cases and CLABSI rate was 1.18 per 1000 central line days. Incidence rate of BSI was 9.8 per 1000 ICU days. Attack rate (cumulative incidence rate) of BSI was 4.8%. 56 (22.2%) patients with BSI expired during hospital stay, 71(28.2%) were discharged against medical advice while 125 (49.5%) recovered. Mortality was slightly higher in patients having BSI with MDR or XDR.

As use of antibiotics has increased, it has led to increased antimicrobial resistance and results in the poor outcome of the patients especially in the ICU as patients in the ICU are already sick and immunocompromised. Knowledge of antimicrobial resistance pattern and

result of culture reports provides guidance for the treatment thus improving outcome of the patient. Also proper precautions, hand hygiene while insertion of catheters and other devices can help in preventing the spread of resistant organisms.

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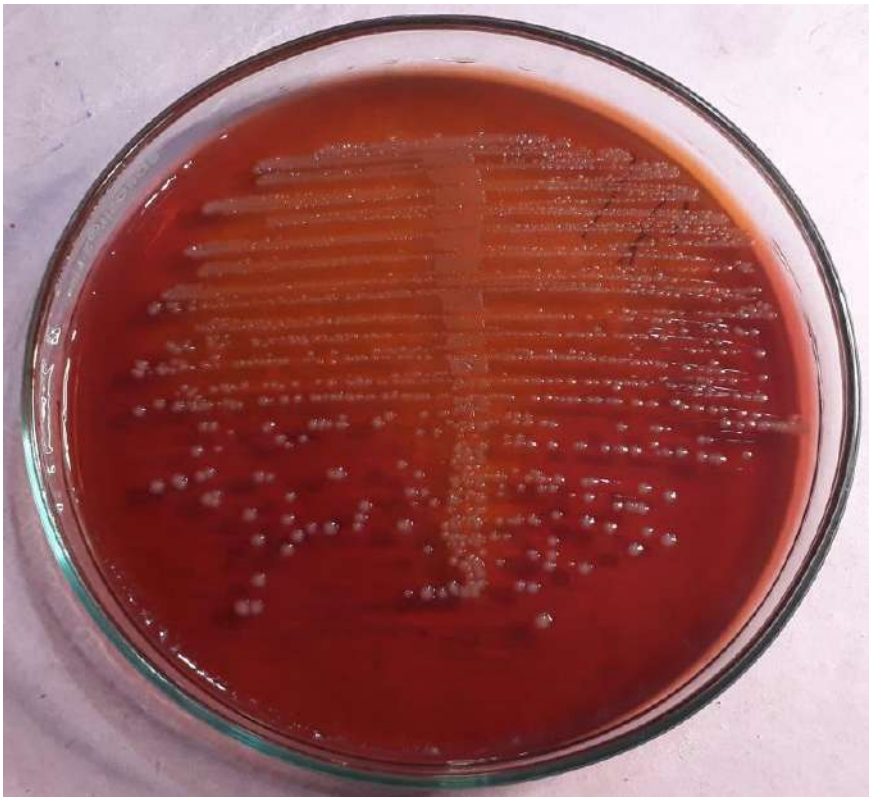
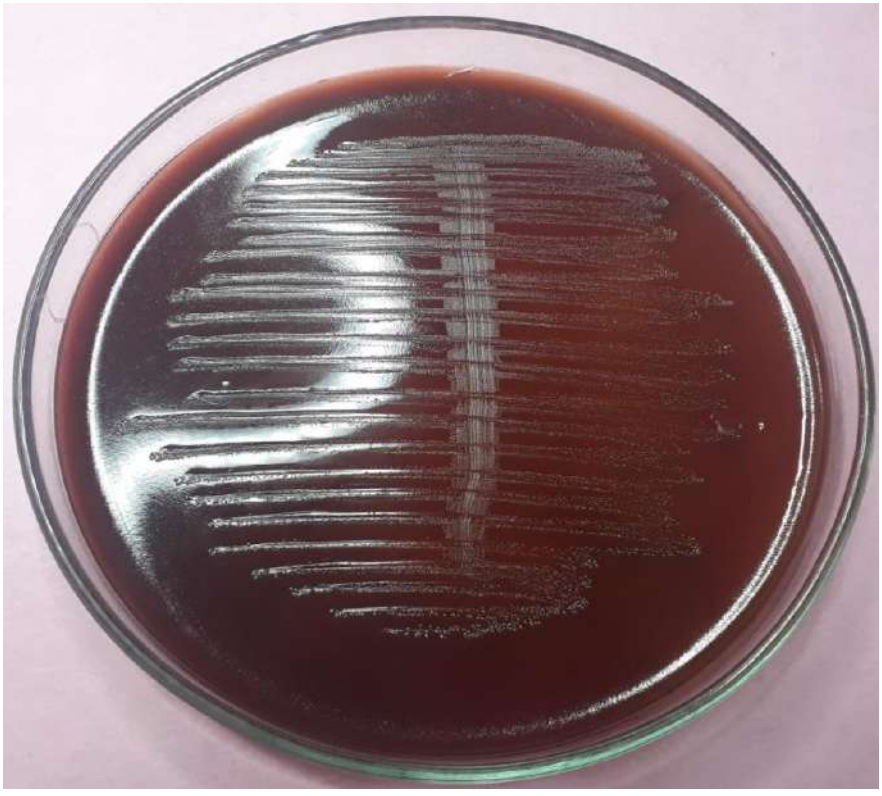
BLOOD CULTURE BOTTLES



MacConkey's agar showgrowth of E. coli



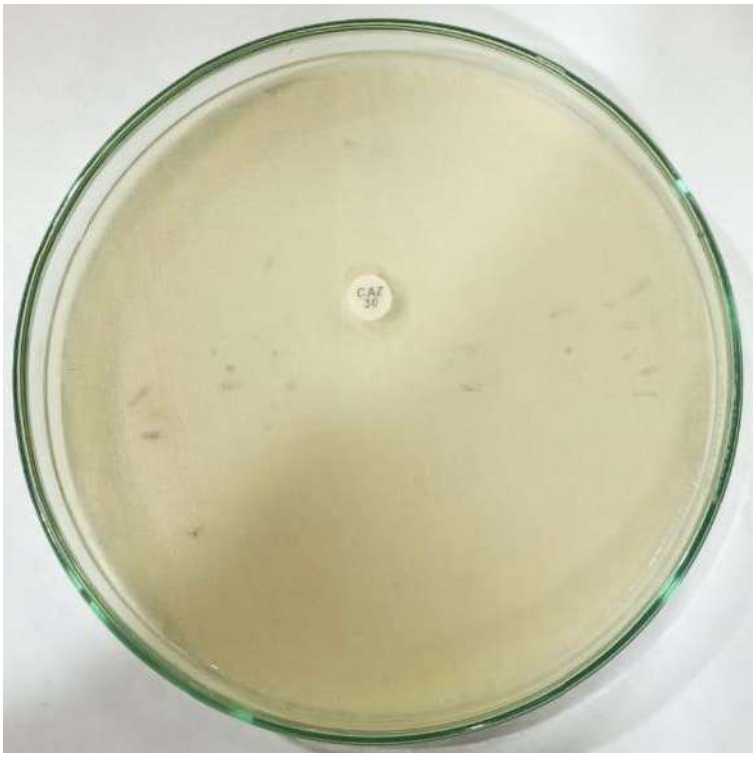
Blood agar showing growth of Enterococcus spp.

BACTEC 9240-BLOOD CULTURE AUTOMATED SYSTEM

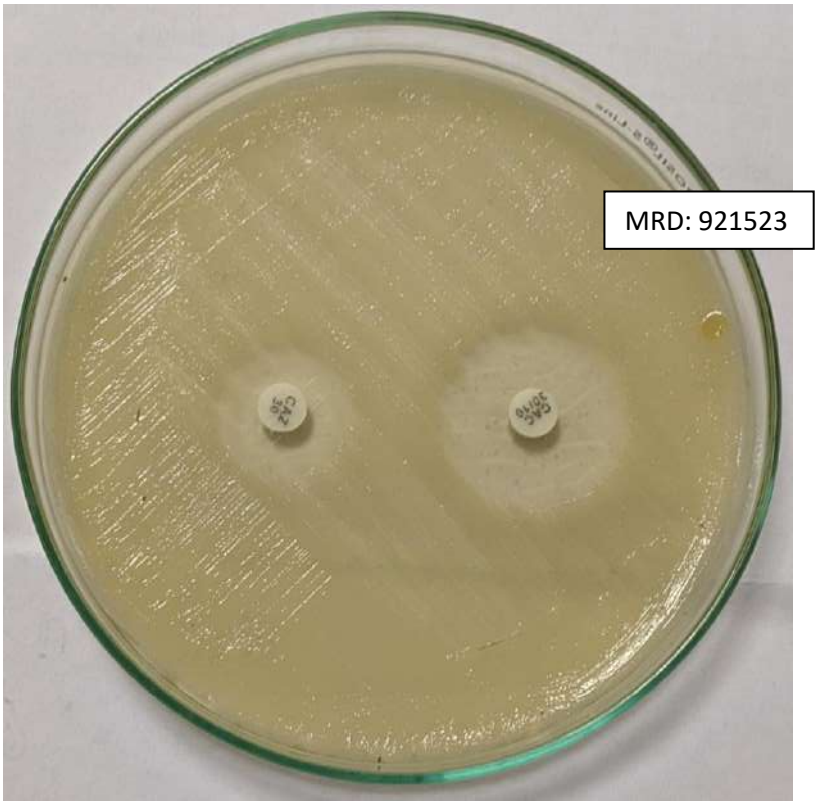
BACT/ALERT-BLOOD CULTURE AUTOMATED SYSTEM

VITEK-2 system

VITEK-2 Identification & AST cards

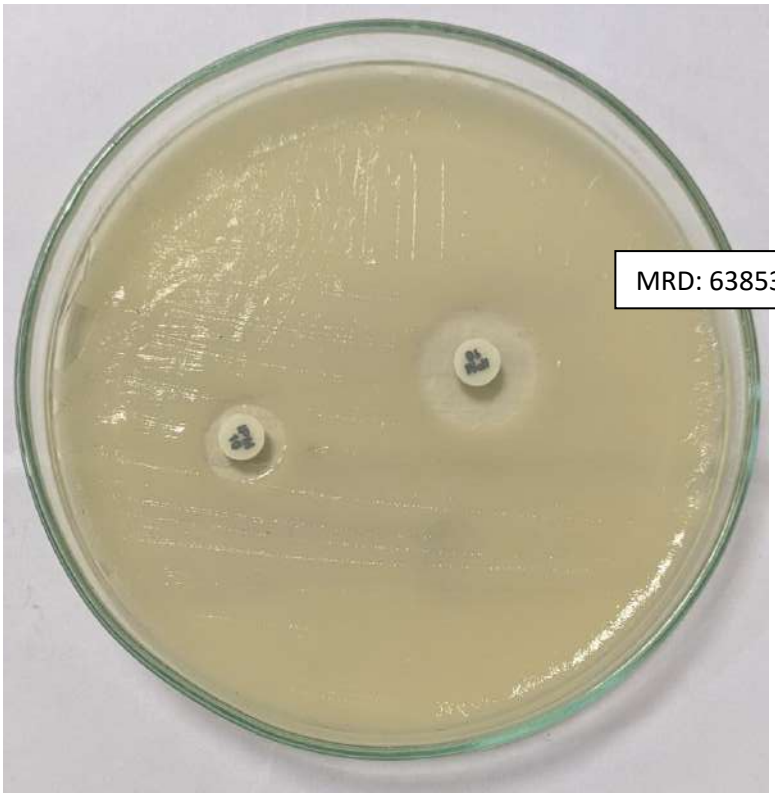


Screening Test for ESBL production



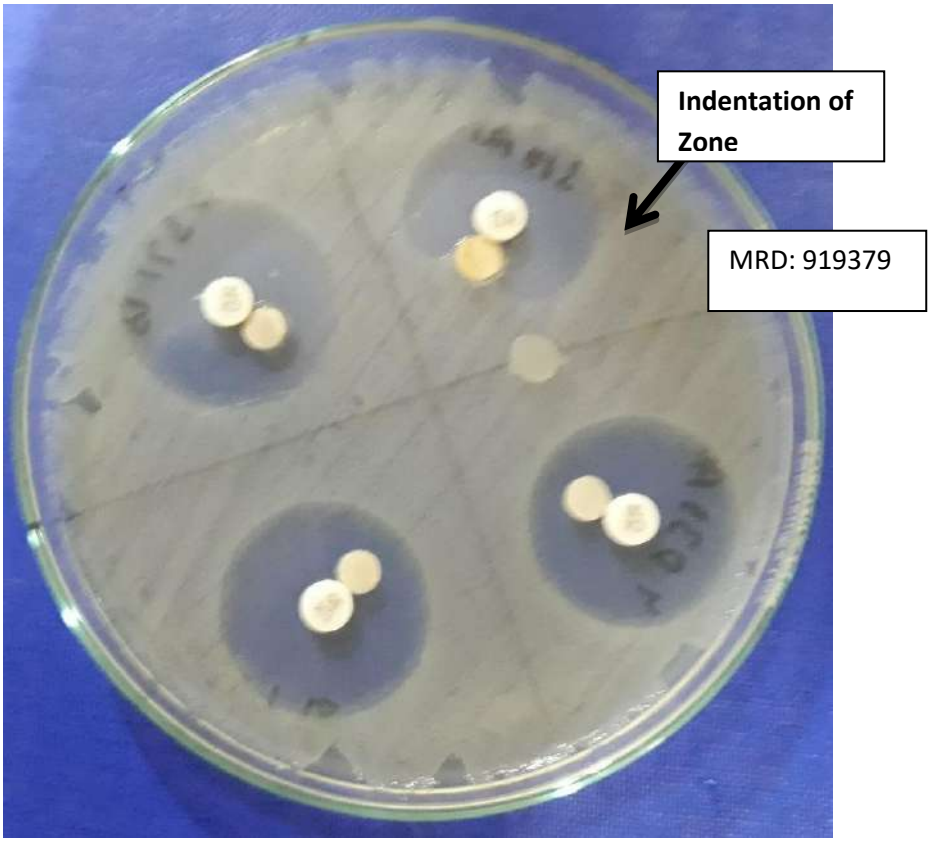
Double disk diffusion test for ESBL production

Screening test for MBL production



Imipenem EDTA Double disk method for MBL production

Screening Test for AmpC production



Confirmatory AmpC Disc Test

S no.	MRD	Initials	Age	Gender	AREA	DOA to hospital	DOD from hospital	Diagnosis	COMORBIDITY	Previous Hospitalization	DOA to ICU	DOD from ICU	ICU days	DOI OF CL	DOR OF CL	CL days	Indication of CL	CVC BLOOD	PER.LINE BLOOD	BLOOD CULTURE	CATHETER TIP
1	817358	H	28	M	TICU	9/24/2019	10/7/2019	Acute gastroenteritis,shoc	-	-	9/25/2019	10/5/2019	13	9/26/2019	10/5/2019	12	TPN	+	+	+	-
2	139310	S	55	M	PCCU	9/21/2019	10/3/2019	RSA,HI	DM HTN	-	9/21/2019	10/1/2019	11	9/23/2019	10/1/2019	8	TPN	+	-	+	-
3	807175	V	51	M	TICU	9/2/2019	9/15/2019	Bronchial asthma	HTN	-	9/2/2019	9/14/2019	12	9/2/2019	9/11/2019	12	CVP monitoring	+	+	+	-
4	818204	V	23	M	NSICU	9/26/2019	10/22/2019	Acute pancreatitis	-	-	9/26/2019	10/20/2019	24	9/30/2020	10/10/2019	10	TPN	+	+	+	-
5	814566	K	31	M	MICU	9/20/2019	10/10/2019	AFI,pneumonia	HTN	-	9/20/2019	10/10/2019	20	9/21/2019	9/29/2019	8	CVP monitoring	+	-	+	-
6	823750	S	72	F	PCCU	10/4/2019	10/14/2019	AFI,B/L pneumonitis	HTN	+	10/4/2019	10/14/2019	10	-	-	-	-	-	+	+	-
7	825424	P	17	F	MICU	10/7/2019	10/12/2019	Electric burns	-	-	10/7/2019	10/10/2019	3	10/7/2019	10/11/2019	5	TPN	+	+	+	-
8	819174	M	48	M	NSICU	10/6/2019	10/28/2019	Renal failure	HTN	-	10/6/2019	10/27/2019	21	10/6/2019	10/10/2019	5	CVP monitoring	+	-	+	-
9	823720	L	26	M	PCCU	10/4/2019	10/14/2019	Acute pancreatitis	HTN	+	10/4/2019	10/14/2019	10	10/4/2019	10/10/2019	7	CVP monitoring	+	+	+	-
10	818471	H	45	M	PCCU	9/26/2019	10/10/2019	Acute gastroenteritis	DM HTN	-	9/26/2019	10/10/2019	12	-	-	-	-	-	+	+	-
11	794139	S	53	F	SICU	10/8/2019	10/11/2019	Diabetic foot	DM	+	10/8/2019	10/11/2019	3	-	-	-	-	-	+	+	-
12	825434	P	62	M	NSICU	10/7/2019	11/1/2019	HTN,BPH,COPD	HTN	-	10/7/2019	10/27/2019	11	10/10/2019	10/29/2019	20	TPN	+	-	+	-
13	828794	S	27	F	PCCU	10/12/2019	10/22/2019	Acute cholecystitis	-	-	10/12/2019	10/22/2019	11	10/12/2019	10/22/2019	10	TPN	+	-	+	-
14	824583	L	59	F	MICU	11/11/2019	11/13/2019	AKI,Encephalopathy	-	-	11/11/2019	11/13/2019	3	-	-	-	-	-	+	+	-
15	832421	H	42	M	PCCU	10/18/2019	10/24/2019	Seizues,acute pancreatitis	HTN	-	10/20/2019	10/24/2019	4	-	-	-	-	-	-	+	-
16	825805	B	40	M	TICU	10/8/2019	11/19/2019	ASOM,meningitis	DM HTN	-	11/2/2019	11/15/2019	13	11/3/2019	11/17/2019	14	CVP monitoring	+	+	+	+
17	834744	J	38	M	MICU	10/22/2019	10/25/2019	RSA	-	-	10/22/2019	10/25/2019	4	-	-	-	-	-	+	+	-
18	833139	K	40	F	MICU	10/20/2019	10/25/2019	COAD,HTN	HTN	-	10/20/2019	10/25/2019	5	-	-	-	-	-	+	+	-
19	836116	M	65	M	MICU	10/24/2019	10/28/2019	Rt.MCA infarct	HTN	-	10/24/2019	10/28/2019	5	-	-	-	-	-	+	+	-
20	835645	S	24	M	MICU	10/24/2019	11/3/2019	AFI,B/L pneumonitis	DM	-	10/30/2019	11/2/2019	4	10/26/2019	11/2/2019	8	TPN	+	+	+	-
21	837103	D	24	M	MICU	10/24/2019	11/3/2019	Acute pancreatitis	DM	-	10/30/2019	11/2/2019	4	-	-	-	-	-	+	+	-
22	839893	S	30	M	PCCU	10/20/2019	10/30/2019	Acute pancreatitis	-	+	10/20/2019	11/30/2019	21	10/20/2019	11/30/2019	10	TPN	+	+	+	-
23	836784	A	45	F	PCCU	10/26/2019	11/9/2019	Head injury	HTN	-	10/28/2019	11/9/2019	12	-	-	-	-	-	+	+	-
24	795800	J	25	M	SICU	9/26/2019	10/8/2019	AFI,shock	DM	-	9/26/2019	10/5/2019	10	-	-	-	-	-	+	+	-
25	800520	M	55	F	MICU	9/2/2019	9/17/2019	Acute gastroenteritis	-	-	9/5/2019	9/11/2019	7	9/4/2019	9/15/2019	12	TPN	+	-	+	-
26	801115	B	36	M	PCCU	9/2/2019	9/11/2019	Hepatic encephalopathy	-	-	9/2/2019	9/11/2019	10	-	-	-	-	-	+	+	-
27	705987	S	82	F	STICU	9/15/2019	9/30/2019	RSA,HI	-	-	9/16/2019	9/30/2019	15	-	-	-	-	-	+	+	-
28	803736	S	55	F	MICU	9/5/2019	9/16/2019	ASOM,meningitis	-	-	9/10/2019	9/16/2019	11	-	-	-	-	-	+	+	-
29	799255	M	57	F	MICU	9/6/2019	9/12/2019	Fall from height,BTC	DM	-	9/10/2019	9/12/2019	3	-	-	-	-	-	+	+	-
30	808782	K	51	F	MICU	9/12/2019	9/24/2019	CLD,GI bleed	DM HTN	-	9/12/2019	9/20/2019	9	-	-	-	-	-	+	+	-
31	805323	S	64	M	SICU	9/7/2019	9/15/2019	Electric burns	-	+	9/7/2019	9/15/2019	8	-	-	-	-	-	+	+	-
32	810501	R	40	F	MICU	9/15/2019	10/4/2019	Electric burns	-	-	9/15/2019	10/4/2019	20	9/17/2019	10/3/2019	17	Administration of drugs	+	+	+	-
33	810626	C	59	M	SICU	9/15/2019	7/30/2020	Head injury	DM	-	9/17/2020	7/26/2020	9	9/17/2020	9/25/2020	8	TPN	+	-	+	-
34	804825	S	50	M	MICU	9/16/2019	9/22/2019	CVA,CLD,HCV+ve	HTN	-	9/18/2019	9/20/2019	3	-	-	-	-	-	+	+	-
35	808934	A	29	M	PCCU	9/13/2019	9/19/2019	Encaphalopathy,CAD	DM HTN	-	9/13/2019	9/19/2019	7	-	-	-	-	-	+	+	-
36	870626	C	48	M	SICU	9/15/2019	9/20/2019	Acute pancreatitis	-	+	9/15/2019	9/20/2019	6	9/16/2019	9/20/2019	5	TPN	+	-	+	-
37	773332	K	83	M	SICU	9/10/2019	9/28/2019	Asthma	-	-	9/15/2019	9/25/2019	11	9/13/2019	9/26/2019	14	CVP monitoring	+	+	+	-
38	788400	K	60	M	PCCU	8/16/2019	9/27/2019	ARF	-	-	8/16/2019	9/27/2019	12	8/16/2019	9/20/2019	34	TPN	+	-	+	-
39	875312	H	45	M	MICU	8/17/2019	8/22/2019	Acute cholecystitis	HTN	-	8/18/2019	8/20/2019	3	-	-	-	-	-	+	+	-
40	790065	G	28	M	SICU	9/10/2019	9/25/2019	Acute pancreatitis	DM	+	9/12/2019	9/22/2019	10	9/13/2019	9/20/2020	7	TPN	+	-	+	-
41	888584	B	48	M	SICU	8/18/2019	8/28/2019	Flame burns	-	-	8/18/2019	8/25/2019	8	-	-	-	-	-	+	+	-
42	202825	N	69	F	MICU	8/18/2019	8/21/2019	Acute gastroenteritis	-	-	8/18/2019	8/20/2019	3	-	-	-	-	-	+	+	-
43	817894	K	32	M	SICU	8/18/2019	8/25/2019	Septicaemia, UTI	HTN	-	8/18/2019	8/20/2019	3	-	-	-	-	-	+	+	-
44	813138	S	35	M	MICU	9/18/2019	10/3/2019	HTN,encephalopathy	DM HTN	-	9/18/2019	9/30/2019	13	9/18/2019	10/1/2019	15	TPN	+	-	+	-
45	794900	B	48	M	SICU	8/25/2019	9/10/2019	Burns	-	-	8/26/2019	9/7/2019	12	8/26/2019	9/5/2019	10	TPN	+	+	+	-
46	422332	S	59	M	MICU	8/31/2019	9/30/2020	RSA,HI	-	-	8/31/2019	9/30/2019	36	8/31/2019	9/25/2019	25	TPN	+	+	+	-
47	870501	R	40	M	TICU	8/31/2019	9/15/2019	ARF	DM HTN	-	8/31/2019	9/10/2019	11	-	-	-	-	-	+	+	-
48	807317	O	30	M	PCCU	9/10/2019	10/11/2019	MCA infarct	-	+	9/10/2019	10/11/2019	32	-	-	-	-	-	-	+	-
49	819503	A	29	F	MICU	9/27/2019	10/10/2019	Acute pancreatitis	-	-	9/27/2019	10/8/2019	12	-	-	-	-	-	+	+	-
50	820242	V	64	F	MICU	9/28/2019	11/2/2019	Flame burns	DM	-	9/28/2019	10/28/2019	31	-	-	-	-	-	+	+	-
51	840142	A	47	M	MICU	11/18/2019	11/18/2019	HTN,encephalopathy	DM	-	11/18/2019	11/18/2019	1	-	-	-	-	-	-	+	-
52	830505	Z	55	F	MICU	10/15/2019	10/26/2019	Acute pancreatitis	HTN	-	10/15/2019	10/20/2019	6	-	-	-	-	-	+	+	-
53	843504	D	65	M	PCCU	12/14/2019	12/30/2019	CA stomach	DM	-	12/15/2019	12/25/2019	11	12/12/2019	12/28/2019	17	CVP monitoring	+	-	+	-
54	834926	K	41	M	SICU	10/20/2019	11/8/2019	AFI	-	-	10/21/2019	11/5/1900	14	10/25/2019	11/3/2019	9	TPN	+	+	+	-
55	840254	S	20	M	PCCU	10/31/2019	11/27/2019	RSA, HI	-	-	10/31/2019	11/25/2019	25	10/31/2019	11/26/2019	27	CVP monitoring	+	-	+	-
56	845466	B	40	M	MICU	11/8/2019	11/9/2019	Uremic encephalopathy	-	+	11/8/2019	11/9/2019	2	-	-	-	-	-	+	+	-
57	846143	R	63	M	MICU	11/9/2019	11/16/2019	Resp.failure	HTN	-	11/9/2019	11/16/2019	8	11/9/2019	11/16/2019	8	TPN	+	-	+	-
58	850120	R	57	F	PCCU	2/2/2020	2/22/2020	AFI	DM	-	2/5/2020	2/10/2020	6	2/5/2020	2/10/2020	6	TPN	+	-	+	-
59	839493	A	58	M	MICU	11/10/2019	11/22/2019	AFI	-	-	11/11/2019	11/20/2019	9	11/11/2019	11/18/2019	7	TPN	+	+	+	-
60	850728	R	33	F	SICU	11/16/2019	12/2/2019	Thrombocytopenia	DM	+	11/20/2019	11/30/2019	11	-	-	-	-	-	+	+	-
61	851721	R	26	F	NSICU	11/18/2019	11/26/2019	Unknown poisoning	DM HTN	-	11/20/2019	11/25/2019	6	-	-	-	-	-	+	+	-
62	845210	S	72	M	MICU	11/8/2019	12/10/2019	Unknown poisoning	-	-	11/10/2019	11/30/2019	21	11/10/2019	12/5/2019	26	TPN	-	+	+	-
63	851840	M	32	F	PCCU	11/8/2019	12/6/2019	Hyponatremic encephalopathy	DM	-	11/10/2019	12/5/2019	26	11/9/2019	11/30/2019	22	TPN	-	+	+	-
64	834957	S	55	F	MICU	11/7/2019	11/20/2019	PUO,Shock	DM	-	11/7/2019	11/17/2019	10	11/9/2019	11/14/2019	8	TPN	+	+	+	-
65	848669	G	30	M	MICU	11/15/2019	11/30/2019	Acute pancreatitis	-	-	11/17/2019	11/25/2019	8	11/18/2019	11/23/2019	5	TPN	+	+	+	-
66	850772	S	38	F	MICU	11/16/2019	12/7/2019	Hepatic encephalopathy	DM	-	11/17/2019	12/5/2019	20	11/20/2019	11/30/2019	10	TPN	+	+	+	-
67	855229	N	57	F	SICU	11/24/2019	12/5/2019	RSA,HI	DM HTN	-	11/24/2019	12/4/2019	12	11/26/2019	12/4/2019	9	TPN	+	+	+	-
68	840280	A	19	F	SICU	10/31/2019	11/28/2019	Electrical burns	-	-	10/31/2019	11/25/2019	26	11/1/2020	11/26/2020	26	TPN	+	-	+	-
69	725501	J	63	M	SICU	1/14/2020	1/14/2020	ALD	DM	-	11/14/2020	11/14/2020	1	-	-	-	-	-	+	+	-
70	856807	A	46	M	MICU	11/26/2019	12/8/2019	CVA,ICH	DM	-	11/26/2019	12/8/2019	13	-	-	-	-	-	+	+	+

S no.	MRD	Initials	DATE OF COLLECTION	LAB ID	GRAM STAIN	TTP (HOURS)	TTP GROUP	ORGANISM	Time to BSI	CLABSI	TLC	fever	HR	RR	CRP	PCT	SOURCE OF INFECTION	MDR	XDR	PDR	MRSA	VRE	PROBABLE ESBL	CONFIRMED ESBL
1	817358	H	10/1/2019	20076c,20077p	GNB	12.5	2	Acinetobacter baumannii	20	NO	39.6	+	92	18	-	5.5	Urine-Acinetobacter baumannii	+	-	-	-	-	-	-
2	139310	S	10/2/2019	20188	GNB	9	1	Klebsiella pneumoniae	13	NO	9.8	-	80	20	-	1.66	-	+	+	-	-	-	+	+
3	807175	V	10/4/2019	20348c20349p	GNB	16	2	Acinetobacter baumannii	5	NO	20	-	82	16	-	20.075	-	+	+	-	-	-	+	-
4	818204	V	10/2/2019	20218c,20219p	GNB	9	1	Klebsiella pneumoniae	19	YES	16.9	+	110	22	-	7.02	-	+	+	-	-	-	+	-
5	814566	K	10/5/2019	20453	GNB	8	1	Acinetobacter baumannii	40	NO	24.3	-	75	14	-	0.67	Drain fluid-Acinetobacter baumannii	+	+	-	-	-	-	-
6	823750	S	10/10/2019	20210	GNB	11.5	1	Klebsiella pneumoniae	16	NO	24.7	-	85	16	-	1.5	-	+	+	-	-	-	+	+
7	825424	P	10/7/2019	20118©,20119(P)	GNB	C-6,P-9	1	Klebsiella pneumoniae	3	NO	36.6	-	72	22	-	5.5	-	+	-	-	-	-	-	-
8	819174	M	10/8/2019	20678	GNB	21	2	Klebsiella pneumoniae	6	YES	34.3	+	60	24	+	7.5	-	+	-	-	-	-	-	-
9	823720	L	10/5/2019	20221©,20222(P)	GPC	C-58,P-43	4	Staphylococcus epidermidis	8	NO	7.1	-	85	20	-	1.5	-	-	-	-	-	-	-	-
10	818471	H	9/28/2019	20180	GNB	8	1	Klebsiella pneumoniae	5	NO	18.7	+	96	26	-	0.5	Urine-Klebsiella	+	-	-	-	-	+	+
11	794139	S	10/9/2019	20717C20718P	GNB	11	1	E.coli	14	NO	16.1	+	102	20	-	4.21	ET-E.coli	+	-	-	-	-	-	-
12	825434	P	10/12/2019	20946	GPC	26.5	3	Staphylococcus epidermidis	19	NO	18.2	+	75	18	-	1.95	-	+	-	-	-	-	-	-
13	828794	S	10/13/2019	21003	GPC	16	2	Staphylococcus aureus	16	NO	15.2	-	65	16	-	29.16	-	-	-	-	+	-	-	-
14	824583	L	10/15/2019	21179	GPC	33	3	Staphylococcus epidermidis	41	NO	30.3	-	87	16	-	0.65	-	+	-	-	-	-	-	-
15	832421	H	10/22/2019	22110	GPC	23	2	Staphylococcus epidermidis	18	NO	8.9	-	92	14	-	1.5	-	+	-	-	-	-	-	-
16	825805	B	10/21/2019	21646©,21647(P)	GPC	C-6,P-16	2	Staphylococcus epidermidis	13.5	NO	12	-	70	18	+	0.2	-	-	-	-	-	-	-	-
17	834744	J	10/22/2019	21769	GNB	11.5	1	Klebsiella pneumoniae	40	NO	7.3	-	72	20	-	-	-	+	-	-	-	-	+	-
18	833139	K	10/22/2019	21718	GNB	10	1	Sphingomonas paucimobilis	23	NO	17.6	-	72	20	-	1.45	-	+	-	-	-	-	-	-
19	836116	M	10/24/2019	21937	GNB	-8	1	Pseudomonas aeruginosa	10	NO	7.1	-	85	20	-	100	-	+	+	-	-	-	-	-
20	835645	S	10/25/2019	21999	GNB	5	1	Stenotrophomonas maltophilia	10	NO	11	-	93	22	-	1.5	Spt/ET- S maltophilia	+	+	-	-	-	-	-
21	837103	D	10/26/2019	22120	BYLC	11	1	Candida tropicalis	12	NO	24.8	-	97	20	-	48.55	-	-	-	-	-	-	-	-
22	839893	S	10/26/2019	21812	GPC	C-16,P-12	2	Enterococcus faecium	29	NO	14.9	-	104	16	-	-	-	+	-	-	-	-	-	-
23	836784	A	10/31/2019	22510	GNCB	15	2	Acinetobacter baumannii	9	NO	11	-	72	14	-	2.3	-	+	-	-	-	-	+	-
24	795800	J	8/31/2019	17594C.17595P	GPC	C15 P-17	2	Staphylococcus epidermidis	18	NO	14	-	150	18	+	11.3	-	+	-	-	-	-	-	-
25	800520	M	9/2/2019	17713	GNB	11	1	Stenotrophomonas maltophilia	13	NO	8.7	-	85	14	-	26.1	-	+	+	-	-	-	-	-
26	801115	B	9/2/2019	17756	GPC	7	1	Enterococcus faecium	13	NO	20.7	-	72	16	-	-	-	+	-	-	-	-	-	-
27	705987	S	9/3/2019	17750	GNB	16	2	Klebsiella pneumoniae	7	NO	16.8	-	94	18	-	-	Urine-Klebsiella	+	+	-	-	-	+	+
28	803736	S	9/6/2019	18046	GNCB	9	1	Acinetobacter baumannii	24	NO	15.3	-	102	20	-	100	ET-Acinetobacter baumannii	+	+	-	-	-	-	-
29	799255	M	9/7/2019	18250	GNB	9	1	Klebsiella pneumoniae	1	NO	28.1	-	85	20	-	-	ET-Kiebsiella	+	+	-	-	-	-	-
30	808782	K	9/12/2019	18605	GPC	13	2	Staphylococcus epidermidis	14	NO	22.5	-	94	22	-	5.3	-	-	-	-	-	-	-	-
31	805323	S	9/13/2019	18269	GNCB	35	3	Acinetobacter baumannii	26	NO	9.7	-	60	24	-	59.9	-	+	-	-	-	-	+	-
32	810501	R	9/26/2019	19715C 19716P	GNB	C-9,P-12	1	Klebsiella pneumoniae	11	NO	15	-	74	26	-	1.31	Tissue -Klebsiella	+	-	-	-	-	+	-
33	810626	C	9/20/2020	C-19168 P19169	BYLC	C-11, P-15	2	Candida tropicalis	20	YES	1.8	+	60	20	+	10.57	-	-	-	-	-	-	-	-
34	804825	S	9/19/2019	19530	GNB	20	2	Pseudomonas aeruginosa	10	NO	25.7	-	82	30	-	-	-	-	-	-	-	-	-	-
35	808934	A	9/16/2019	18901	GNB	17	2	Pseudomonas aeruginosa	5	NO	8.3	-	90	20	-	0.2	-	-	-	-	-	-	-	-
36	870626	C	9/17/2019	18550	GNB	9	1	E.coli	11	NO	5.7	-	110	20	+	-	Urine-E.coli	+	-	-	-	-	-	-
37	773332	K	9/20/2019	19185C,19186P	GNB	C-10.5,P-12	1	Klebsiella pneumoniae	8	NO	15.4	-	88	20	-	11.7	-	+	+	-	-	-	-	-
38	788400	K	8/23/2019	C-16934,P-16935	GPC	C-13,P-20	2	Staphylococcus haemolyticus	7	NO	18.9	-	96	18	-	16.4	-	-	-	-	-	-	-	-
39	875312	H	8/25/2019	17150	GNB	8	1	Klebsiella pneumoniae	5	NO	36.1	-	70	16	-	-	-	+	+	-	-	-	+	+
40	790065	G	9/16/2019	18851	GNB	12	1	Serratia marscenses	16	YES	15.5	+	80	20	-	0.4	-	+	+	-	-	-	+	+
41	888584	B	8/24/2019	18115	GNB	18	2	Klebsiella pneumoniae	5	NO	3	-	60	16	-	1.5	-	+	-	-	-	-	-	-
42	202825	N	8/25/2019	18250	GNCB	21	2	Acinetobacter baumannii	9	NO	18	-	74	16	-	0.5	-	+	-	-	-	-	+	-
43	817894	K	9/25/2019	19632	GNB	11	1	Klebsiella pneumoniae	6	NO	11	-	78	20	-	32.7	-	-	-	-	-	-	-	-
44	813138	S	9/26/2019	19675	GPC	10	1	Staphylococcus epidermidis	14	NO	20.6	-	86	20	-	11.1	-	-	-	-	-	-	-	-
45	794900	B	8/31/2020	c-17583,p-1784	BYLC	c-7,p-12	1	Candida parapsilosis	22	YES	14.6	+	70	22	+	54.4	-	-	-	-	-	-	-	-
46	422332	S	9/22/2019	19550	GPC	14	2	Staphylococcus epidermidis	17	NO	19.8	-	90	24	-	1.5	-	-	-	-	-	-	-	-
47	870501	R	9/2/2019	18175	GNCB	17	2	Acinetobacter baumannii	16	NO	10	-	84	18	-	-	-	+	+	-	-	-	+	-
48	807317	O	9/15/2019	19110	GPC	16	2	Staphylococcus haemolyticus	0	NO	4.5	-	72	16	-	0.5	-	+	-	-	-	-	-	-
49	819503	A	9/27/2019	19798	BYLC	41	3	Candida albicans	23	NO	20.1	-	88	16	-	-	-	-	-	-	-	-	-	-
50	820242	V	9/28/2019	19910	GNB	11.5	1	Stenotrophomonas maltophilia	11	NO	8.5	-	96	18	-	1.6	-	+	+	-	-	-	-	-
51	840142	A	11/2/2019	22664	GNB	11	1	Klebsiella pneumoniae	12	NO	43.5	-	106	18	-	0.72	ET/Wound swab-Klebsiella	+	+	-	-	-	+	+
52	830505	Z	10/15/2019	21196	GNCB	13	2	Acinetobacter baumannii	3	NO	10.5	+	72	16	-	73.2	-	+	+	-	-	-	+	+
53	843504	D	11/5/2019	22899	GPC	15.5	2	Staphylococcus epidermidis	13	NO	17.1	-	160	20	-	29.6	-	-	-	-	-	-	-	-
54	834926	K	10/30/2019	C-22423, p-22424	GNCB	18	2	Acinetobacter baumannii	15	YES	24.5	+	80	18	-	34.5	-	+	+	-	-	-	-	-
55	840254	S	11/7/2019	C-22972,P-22973	GNCB	21	2	Acinetobacter baumannii	4	NO	9.8	-	72	24	-	4.4	Urine-Acinetobacter baumannii	+	+	-	-	-	+	-
56	845466	B	11/8/2019	23156	GPC	18	2	Staphylococcus haemolyticus	43	NO	34.9	-	84	28	-	1.5	-	+	+	-	-	-	-	-
57	846143	R	11/14/2019	23599	GNB	13.5	2	Klebsiella pneumoniae	11	NO	24	-	76	14	-	56.1	-	+	+	-	-	-	-	-
58	850120	R	11/15/2019	23714	GPC	19.5	2	Staphylococcus haemolyticus	6	NO	17.1	-	94	14	-	18.4	-	+	-	-	-	-	-	-
59	839493	A	11/14/2019	C-23597, P-23598	BYLC	C-9,P-12	1	Candida tropicalis	14	YES	16.5	+	80	18	-	1.5	-	-	-	-	-	-	-	-
60	850728	R	18-11-019	23877	GNB	10.5	1	E.coli	3	NO	16.1	-	60	16	-	-	-	+	+	-	-	-	-	-
61	851721	R	11/18/2019	23913	GNB	8	1	E.coli	4	NO	20	-	84	18	-	0.72	ET-E.coli	+	+	-	-	-	+	+
62	845210	S	11/18/2019	23885	GPC	13	2	Staphylococcus epidermidis	9	NO	17.3	-	110	20	-	21.7	-	+	-	-	-	-	-	-
63	851840	M	11/19/2019	23955	BYLC	7.5	1	Candida albicans	5	NO	14	+	72	22	-	4.3	-	-	-	-	-	-	-	-
64	834957	S	11/12/2019	23896	GPC	14	2	Enterococcus faecium	24	YES	15	-	74	16	-	1.16	-	+	-	-	-	+	-	-
65	848669	G	11/21/2019	C24133,P-24134	GNB	64	4	Klebsiella pneumoniae	23	YES	16.1	-	70	16	-	0.9	-	+	+	-	-	-	+	-
66	850772	S	11/23/2019	24298	BYLC	11.5	1	Candida lusitaniae	6	NO	11	-	60	14	-	4.83	Drain fluid-C.tropicalls	-	-	-	-	-	-	-
67	855229	N	11/24/2019	24387	GNB	18	2	Klebsiella pneumoniae	1	NO	15.3	-	85	18	-	50.08	-	-	-	-	-	-	+	+
68	840280	A	11/20/2019	24274	GNCB	23	2	Acinetobacter baumannii	6	NO	14	-	74	18	-	3.11	-	+	-	-	-	-	-	-
69	725501	J	11/28/2019	24794	GPC	13.5	2	Staphylococcus aureus	28	NO	21.6	-	74	20	+	1.5	-	+	-	-	+	-	-	-
70	856807	A	11/27/2019	24400	BYLC	6.5	1	Candida tropicalis	24	NO	7.6	-	98	22	-	0.5	-	-	-	-	-	-	-	-

S no.	MRD	Initials	PROBABLE AmpC	CONFIRMED AmpC	PROBABLE MBL	CONFIRMED MBL	OUTCOME	AMP	P/T	CXM	CAZ	CTR	CFPZ+SB	CPM	ERT	IM	MM	DOR	AK	GEN	AMC	CIP	LEVO	TET	MIN	TGC	CX	COTRI	CX SCREEN	P	OXA	HLG	CD	ERY	LZD	VA	RA	TEICO	DAPTO	FLUCON	FLUCYT	AMP B	CASPO	VORI
1	817358	H	-	-	-	-	RECOVERED	R	R	-	R	R	S	R	-	R	R	-	R	R	R	R	S	-	S	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	139310	S	-	-	+	-	RECOVERED	-	R	R	-	R	R	R	R	R	R	-	S	R	R	R	-	-	-	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	807175	V	-	-	+	-	DAMA	R	R	-	R	R	R	R	-	R	R	-	R	R	R	R	R	-	R	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	818204	V	-	-	+	+	RECOVERED	-	R	R	-	R	R	R	R	R	R	-	R	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	814566	K	-	-	+	+	RECOVERED	R	R	-	R	R	R	R	-	R	R	-	R	R	R	R	R	-	R	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	823750	S	+	-	+	-	DAMA	-	S	R	-	R	R	R	R	R	R	-	R	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	825424	P	-	-	-	-	Expired	-	R	R	-	R	S	S	S	S	S	-	S	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	819174	M	-	-	-	-	RECOVERED	-	R	R	-	R	R	R	R	S	R	-	R	R	R	R	-	-	-	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	823720	L	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	R	-	R	R	S	-	-	-	R	-	R	R	-	R	R	S	S	R	S	S	-	-	-	-
10	818471	H	+	-	-	-	Expired	-	R	R	-	R	R	R	R	R	R	-	R	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	794139	S	+	+	-	-	DAMA	R	R	R	-	R	R	R	R	R	R	-	S	S	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	825434	P	-	-	-	-	Expired	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	R	S	-	-	-	S	+	R	S	-	R	R	S	S	R	S	S	-	-	-	-
13	828794	S	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	R	R	-	-	-	S	+	R	R	S	R	R	S	S	S	S	R	-	-	-	-
14	824583	L	-	-	-	-	DAMA	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	R	S	-	-	-	S	+	R	S	-	R	R	S	S	R	S	S	-	-	-	-
15	832421	H	-	-	-	-	DAMA	-	-	-	-	-	-	-	-	-	-	-	-	R	-	R	R	S	-	-	-	R	+	R	R	-	R	R	S	S	R	S	S	-	-	-	-
16	825805	B	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	R	-	R	R	S	-	-	-	R	-	S	R	-	R	R	S	S	S	S	S	-	-	-	-
17	834744	J	+	-	-	-	RECOVERED	-	S	R	-	S	S	R	S	R	R	-	-	R	-	R	-	-	-	-	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	833139	K	+	+	+	-	Expired	R	R	-	S	R	R	S	-	R	R	R	R	R	R	R	R	-	R	R	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	836116	M	-	-	-	-	RECOVERED	R	R	-	S	R	R	S	-	R	R	R	S	S	R	S	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	835645	S	-	-	-	-	DAMA	R	R	-	S	R	S	R	-	R	R	R	S	R	R	R	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	837103	D	-	-	-	-	Expired	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	S	S	S	S	S
22	839893	S	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	R	-	R	R	S	-	-	-	R	-	R	-	R	R	S	S	-	S	R	-	-	-	-	-
23	836784	A	-	-	+	-	RECOVERED	R	S	-	S	R	S	S	-	S	S	-	S	S	R	R	R	-	S	S	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	795800	J	-	-	-	-	DAMA	-	-	-	-	-	-	-	-	-	-	-	-	R	-	R	R	R	-	-	-	S	+	R	-	-	S	R	S	S	S	S	S	-	-	-	-
25	800520	M	-	-	-	-	RECOVERED	R	R	-	R	R	S	R	-	R	R	-	S	R	R	R	R	-	R	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	801115	B	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	R	-	R	R	R	-	-	-	R	-	R	-	S	-	R	S	S	-	S	R	-	-	-	-
27	705987	S	-	-	+	-	DAMA	-	S	R	-	R	R	R	R	R	R	-	R	R	R	R	-	-	-	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	803736	S	-	-	+	+	RECOVERED	R	R	-	R	R	R	R	-	R	R	-	R	R	R	R	R	-	S	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	799255	M	+	+	+	-	Expired	-	R	R	-	R	R	R	R	R	R	-	R	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	808782	K	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	R	R	-	-	-	R	-	R	R	-	S	S	S	S	S	S	S	-	-	-	-
31	805323	S	-	-	-	-	DAMA	R	R	-	R	R	R	R	-	R	R	-	S	S	R	S	S	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32	810501	R	-	-	+	-	DAMA	-	R	R	-	R	R	R	R	R	R	-	S	R	-	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	810626	C	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	S	S	S	S	S
34	804825	S	-	-	-	-	RECOVERED	R	S	-	S	R	S	S	-	R	R	R	S	S	R	S	S	-	R	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35	808934	A	-	-	-	-	RECOVERED	R	S	-	S	R	S	S	-	S	S	R	S	S	R	S	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
36	870626	C	+	-	-	-	RECOVERED	R	R	R	-	R	S	R	S	S	-	-	S	R	S	R	-	-	-	S	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
37	773332	K	-	-	+	+	DAMA	-	R	R	-	R	R	R	S	R	R	-	R	R	-	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
38	788400	K	-	-	-	-	DAMA	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	R	R	-	-	-	R	-	R	R	-	S	S	S	S	S	S	S	-	-	-	-
39	875312	H	+	+	-	-	RECOVERED	-	R	R	-	R	R	R	R	R	R	-	R	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
40	790065	G	-	-	-	-	RECOVERED	R	S	-	R	R	R	R	-	R	R	R	R	S	R	R	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
41	888584	B	-	-	+	-	DAMA	-	R	R	-	R	R	R	R	R	R	-	R	R	R	R	-	-	-	S	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
42	202825	N	+	+	+	-	Expired	R	R	-	R	R	R	R	-	R	R	-	R	R	R	R	-	-	-	S	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
43	817894	K	-	-	-	-	DAMA	-	S	R	-	S	S	S	S	S	S	-	S	S	-	S	-	-	-	S	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
44	813138	S	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	R	S	-	-	-	R	-	R	R	-	R	R	S	S	S	S	S	-	-	-	-
45	794900	B	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	S	S	S	S	S
46	422332	S	-	-	-	-	Expired	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	R	S	-	-	-	S	-	R	R	-	S	R	R	R	-	R	S	-	-	-	-
47	870501	R	+	+	+	-	DAMA	R	R	-	R	R	S	R	-	R	R	-	R	R	R	R	R	-	R	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
48	807317	O	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	R	S	-	-	-	R	-	R	S	-	R	R	S	S	S	S	S	-	-	-	-
49	819503	A	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	S	S	S	S	S
50	820242	V	-	-	-	-	DAMA	R	S	-	R	R	S	S	-	R	R	R	R	R	R	R	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
51	840142	A	+	+	+	-	Expired	-	R	R	-	R	R	R	R	R	R	-	R	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
52	830505	Z	-	-	+	-	DAMA	R	S	-	R	R	R	R	-	R	R	-	S	R	R	R	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
53	843504	D	-	-	-	-	Expired	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	R	S	-	-	-	R	-	S	S	-	S	R	R	R	R	R	-	-	-	-	-
54	834926	K	-	-	-	-	RECOVERED	R	R	-	R	R	R	R	-	R	R	-	R	R	R	R	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
55	840254	S	-	-	+	+	RECOVERED	R	R	-	R	R	R	R	-	R	R	-	R	R	R	R	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
56	845466	B	-	-	-	-	DAMA	-	-	-	-	-	-	-	-	-	-	-	-	R	-	R	R	S	-	-	-	S	-	R	S	-	R	S	R	S	-	R	R	-	-	-	-
57	846143	R	+	+	-	-	DAMA	-	R	R	-	R	R	R	R	R	R	-	S	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
58	850120	R	-	-	-	-	Expired	-	-	-	-	-	-	-	-	-	-	-	-	S	-	S	R	S	-	-	-	S	+	R	R	-	R	R	S	S	S	S	S	-	-	-	-
59	839493	A	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	S	S	S	S	S
60	850728	R	+	+	+	-	Expired	R	R	R	-	R	R	R	R	R	R	-	S	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
61	851721	R	-	-	+	-	RECOVERED	R	R	R	-	R	R	R	R	R	R	-	R	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
62	845210	S	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	R	-	S	R	S	-	-	-	R	-	R	R	-	R	R	S	S	S	S	S	-	-	-	-
63	851840	M	-	-	-	-	DAMA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	R	S	S	S	S
64	834957	S	-	-	-	-	Expired	-	-	-	-	-	-	-	-	-	-	-	-	R	-	R	R	S	-	-	-	R	-	R	-	-	R	S	R	-	S	R	-	-	-	-	-
65	848669	G	+	-	-	-	DAMA	-	S	S	-	S	S	S	S	S	S	-	S	S	S	S	-	-	-	S	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
66	850772	S	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	S	S	S	S	S
67	855229	N	+	-	-	-	RECOVERED	-	S	S	-	S	S	S	S	S	S	-	R	S	S	S	-	-	-	S	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
68	840280	A	+	-	+	-	RECOVERED	R	R	-	R	R	R	R	-	R	R	-	S	R	R	R	R	-	S	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
69	725501	J	-	-	-	-	DAMA	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	R	R	-	-	-	R	+	R	R	-	R	R	S	S	R	S	S	-	-	-	-
70	856807	A	-	-	-	-	DAMA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	R	S	S	S	S

S no.	MRD	Initials	Age	Gender	AREA	DOA to hospital	DOD from hospital	Diagnosis	COMORBIDITY	Previous Hospitalization	DOA to ICU	DOD from ICU	ICU days	DOI OF CL	DOR OF CL	CL days	Indication of CL	CVC BLOOD	PER.LINE BLOOD	BLOOD CULTURE	CATHETER TIP
71	857305	G	55	M	PCCU	11/27/2019	12/1/2019	AFI	-	-	11/28/2019	31-11-2019	4	-	-	-	-	-	-	+	-
72	858092	S	32	M	PCCU	11/28/2019	12/10/2019	TIA	DM	-	11/28/2019	12/5/2019	8	-	-	-	-	-	+	+	-
73	857492	R	52	F	SICU	2/10/2020	2/18/2020	AKI,Encephalopathy	-	-	11/11/2020	11/18/2020	8	2/11/2020	2/15/2020	6	TPN	+	+	+	-
74	856826	J	25	M	TICU	11/26/2019	12/12/2019	Cellulitis(L)thigh	DM	-	11/28/2019	12/5/2019	9	11/28/2019	12/3/2019	7	CVP monitoring	+	+	+	-
75	859288	B	65	M	PCCU	11/27/2019	12/7/2019	CLD,portal HTN	HTN	+	11/28/2019	12/5/2019	9	11/29/2019	12/7/2019	9	CVP monitoring	+	+	+	-
76	828904	A	23	M	SICU	12/7/2019	12/20/2019	Acute pancreatitis	DM	-	12/8/2019	12/18/2019	11	12/8/2019	12/13/2019	5	CVP monitoring	+	+	+	-
77	860133	N	59	M	MICU	12/2/2019	12/17/2019	Lt.MCA infarct	HTN	+	12/5/2019	12/15/2019	11	-	-	-	-	-	+	+	-
78	796639	S	62	M	MICU	1/24/2020	1/29/2020	Acute gastroenteritis	HTN	-	1/25/2020	1/28/2020	4	-	-	-	-	-	+	+	-
79	860130	G	55	M	MICU	12/2/2019	12/7/2019	RSA,BTA	DM	-	12/2/2019	12/5/2019	4	12/4/2019	12/5/2019	1	TPN	+	+	+	-
80	860558	G	35	M	PCCU	12/3/2019	12/20/2019	Rt.MCA infarct	DM HTN	-	12/4/2019	12/15/2019	12	-	-	-	-	-	+	+	-
81	863419	P	25	F	SICU	12/7/2019	12/11/2019	Malignant meningioma	HTN	+	12/7/2019	12/11/2019	5	-	-	-	-	-	+	+	-
82	828910	I	60	M	PCCU	12/13/2019	12/18/2019	AFI,shock	-	-	12/13/2019	18-12-20191	6	-	--	-	-	-	+	+	-
83	856172	J	70	M	PCCU	12/9/2019	12/23/2019	Electric burns	-	-	12/9/2019	12/20/2019	11	-	-	-	-	-	+	+	-
84	860785	P	39	F	MICU	12/3/2019	12/16/2019	ALD,GI bleed	-	-	12/4/2019	12/15/2019	12	-	-	-	-	-	+	+	-
85	866604	R	55	M	SICU	12/13/2019	1/13/2020	SDH	HTN	-	12/13/2019	1/10/2020	25	12/13/2019	12/28/2019	15	TPN	+	+	+	-
86	843504	D	65	M	MICU	12/14/2019	1/30/2020	AFI	-	-	12/15/2019	1/20/2020	26	-	-	-	-	-	+	+	-
87	867174	B	62	M	MICU	12/15/2019	12/30/2019	Chr,asthma	DM	+	12/16/2019	12/25/2019	10	-	-	-	-	-	+	+	-
88	857541	M	35	M	PCCU	11/27/2019	12/30/2019	Pneumonia	-	-	11/27/2019	12/30/2019	4	-	-	-	-	-	+	+	-
89	865644	L	32	M	SICU	12/11/2019	12/30/2019	RSA,BTC	DM	-	12/11/2019	12/30/2019	19	12/12/2019	12/20/2019	8	TPN	+	+	+	-
90	843546	N	32	F	STICU	1/8/2020	1/11/2020	AFI	-	-	1/8/2020	1/11/2020	3	-	-	-	-	-	+	+	-
91	867290	R	67	M	STICU	12/15/2019	12/26/2019	CLD,CKD	-	-	12/15/2019	12/26/2019	11	12/16/2019	12/20/2019	4	TPN	+	-	+	-
92	672925	S	38	M	TICU	12/19/2019	12/28/2019	Cervical spine injury	DM	-	12/20/2019	12/25/2019	6	12/21/2019	12/24/2019	3	TPN	+	+	+	-
93	595981	G	54	F	PCCU	12/20/2019	12/21/2019	Uremic encephalopathy	-	-	12/20/2019	12/21/2019	1	-	-	-	-	-	+	+	-
94	870537	R	47	F	STICU	12/21/2019	12/26/2019	Acute pancreatitis	-	-	12/21/2019	12/26/2019	6	-	-	-	-	-	+	+	-
95	861836	J	54	M	STICU	12/5/2019	12/26/2020	Flame burns	-	-	12/5/2019	12/26/2020	12	-	-	-	-	-	-	+	-
96	855024	P	55	M	STICU	2/10/2020	2/12/2020	Flame burns	DM HTN	-	2/10/2020	2/12/2020	2	-	-	-	-	-	+	+	-
97	55062	H	78	M	STICU	12/24/2019	1/18/2020	Meningitis	-	+	12/24/2019	1/10/2020	16	12/23/2019	12/31/2019	8	CVP monitoring	+	+	+	-
98	869559	A	59	F	SICU	12/19/2019	12/29/2020	Acute gastroenteritis	DM	-	12/19/2019	12/22/2020	4	-	-	-	-	-	+	+	-
99	84164	R	73	F	MICU	12/26/2019	1/6/2020	ALD,Acute hepatitis	DM HTN	-	12/26/2019	1/1/2020	7	-	-	-	-	-	+	+	-
100	251907	A	57	F	PCCU	12/27/2019	1/15/2020	ALD,acute gastritis	-	+	12/27/2019	1/1/2020	6	-	-	-	-	-	+	+	-
101	874183	K	32	F	NSICU	12/30/2019	1/11/2020	RSA,HI	DM	-	12/30/2019	1/4/2020	5	-	-	-	-	-	+	+	-
102	866609	N	84	M	MICU	1/29/2020	1/30/2020	Gall stone pancreatitis	-	-	1/29/2020	1/30/2020	1	-	-	-	-	-	+	+	-
103	739837	J	45	F	MICU	12/31/2019	1/10/2020	AFI	-	-	12/31/2019	1/10/2020	10	-	-	-	-	-	+	+	-
104	874396	A	63	M	STICU	12/31/2019	1/17/2020	CKD,gastritis	DM HTN	+	12/31/2019	1/10/2020	10	1/1/2020	1/7/2020	7	TPN	+	+	+	-
105	875916	A	50	M	STICU	1/3/2020	1/11/2020	RSA,HI	DM	-	1/3/2020	1/11/2020	9	-	-	-	-	-	+	+	-
106	875601	S	19	M	SICU	1/3/2020	1/9/2020	Rt.MCA infarct	HTN	-	1/3/2020	1/9/2020	7	1/4/2020	1/8/2020	4	TPN	+	+	+	-
107	874673	C	60	F	MICU	1/1/2020	1/19/2020	Hepatic encephalopathy	-	+	1/1/2020	1/10/2020	10	-	-	-	-	-	+	+	-
108	873200	V	65	M	STICU	1/1/2020	1/15/2020	CVA	HTN	-	1/1/2020	1/15/2020	15	1/2/2020	1/8/2020	6	TPN	+	-	+	-
109	873654	T	35	M	TICU	12/28/2019	1/18/2020	ARF	DM HTN	+	12/30/2019	1/10/2020	11	12/31/2019	1/5/2020	5	TPN	+	+	+	-
110	873208	J	40	F	SICU	12/27/2019	1/13/2020	Met.acidosis,septic shock	DM	-	12/27/2019	1/13/2020	17	-	-	-	-	-	+	+	-
111	878975	S	61	F	STICU	1/9/2020	1/14/2020	Fulminant hepatic failure	-	-	1/9/2020	1/12/2020	4	-	-	-	-	-	+	+	-
112	878990	A	51	M	MICU	1/10/2020	1/11/2020	Flame burns	-	-	1/10/2020	1/11/2020	2	-	-	-	-	-	+	+	-
113	873247	A	59	M	MICU	12/28/2019	1/20/2020	Acute gastroenteritis	-	-	12/28/2019	1/15/2020	19	-	-	-	-	-	+	+	-
114	866185	S	45	F	SICU	1/10/2020	1/20/2020	AFI	DM	-	1/10/2020	1/20/2020	10	1/11/2020	1/17/2020	7	TPN	+	-	+	-
115	523274	U	65	F	SICU	1/16/2020	1/22/2020	CLD,Hepatic encephalothy	HTN	-	1/16/2020	1/22/2020	7	1/15/2020	1/20/2020	5	CVP monitoring	+	+	+	-
116	29675	S	29	M	SICU	3/13/2020	3/14/2020	Acute gastroenteritis,shock	-	+	3/13/2020	3/14/2020	2	-	-	-	-	-	+	+	-
117	882795	K	78	M	SICU	1/18/2020	1/20/2020	Acute cholecystitis	-	-	1/18/2020	1/20/2020	3	-	-	-	-	-	+	+	-
118	882176	S	42	M	NSICU	1/16/2020	2/1/2020	P/O VSD closure	DM	+	1/16/2020	1/30/2020	15	1/17/2020	1/25/2020	8	TPN	+	-	+	-
119	884065	R	47	M	SICU	1/20/2020	1/23/2020	Chr.asthma	DM HTN	+	1/20/2020	1/23/2020	3	-	-	-	-	-	+	+	-
120	884101	S	23	F	MICU	1/20/2020	1/22/2020	Asthma-acute axacebation	-	+	1/20/2020	1/22/2020	3	-	-	-	-	-	+	+	-
121	873501	S	50	M	MICU	12/28/2019	12/31/2020	AFI	-	-	12/28/2019	12/31/2020	4	12/27/2020	12/30/2020	3	TPN	+	+	+	+
122	697331	R	59	M	MICU	1/23/2020	2/1/2020	RSA	-	-	1/23/2020	2/1/2020	9	1/25/2020	1/30/2020	5	TPN	+	-	+	-
123	886544	A	32	M	PCCU	1/24/2020	1/31/2020	Rt.MCA infarct	HTN	-	1/24/2020	1/31/2020	8	-	-	-	-	-	+	+	+
124	886593	R	60	M	PCCU	1/25/2020	2/3/2020	Bacterial meningitis	-	-	1/25/2020	2/1/2020	8	-	-	-	-	-	+	+	-
125	881091	T	37	F	MICU	1/15/2020	2/7/2020	Acute pancreatitis	HTN	-	1/15/2020	2/1/2020	17	1/20/2020	1/25/2020	5	TPN	+	+	+	-
126	887253	M	65	F	MICU	1/26/2020	2/10/2020	COPD	DM	-	1/26/2020	2/5/2020	10	-	-	-	-	-	+	+	-
127	884723	H	50	M	PCCU	4/26/2020	4/26/2020	Rt.MCA infarct	-	-	4/26/2020	4/26/2020	1	-	-	-	-	-	+	+	-
128	887231	M	54	M	PCCU	1/15/2020	2/7/2020	HCV reltd.cirrhosis	-	+	1/15/2020	2/2/2020	17	-	-	-	-	-	+	+	-
129	883391	K	66	M	NSICU	1/16/2020	1/30/2020	RTA	-	-	1/16/2020	1/25/2020	10	-	-	-	-	-	+	+	-
130	880252	V	25	M	PCCU	1/13/2020	2/12/2020	Resp.failure	-	-	1/15/2020	2/10/2020	25	-	-	-	-	-	+	+	-
131	153906	H	86	M	STICU	1/26/2020	1/30/2020	AFI,pneumonia	HTN	+	1/26/2020	1/30/2020	5	-	-	-	-	-	+	+	-
132	880228	J	55	M	PCCU	1/12/2020	2/10/2020	Hypertensive stroke	HTN	-	1/12/2020	1/30/2020	18	-	-	-	-	-	+	+	-
133	888519	P	34	M	TICU	1/28/2020	2/27/2020	RSA,BTA	-	-	1/28/2020	2/20/2020	22	1/30/2020	2/10/2020	10	TPN	+	-	+	-
134	878423	S	34	F	SICU	1/8/2020	2/21/2020	Acute pancreatitis	DM HTN	-	1/10/2020	2/15/2020	6	1/11/2020	1/31/2020	20	TPN	+	-	+	-
135	891287	S	24	M	MICU	2/2/2020	2/10/2020	Peptic ulcer ds.	-	-	2/5/2020	2/7/2020	3	-	-	-	-	-	+	+	-
136	752997	G	69	M	PCCU	2/3/2020	2/8/2020	Pulm.Koch's	-	-	2/3/2020	2/8/2020	6	-	-	-	-	-	-	+	-
137	892093	S	62	F	MICU	2/4/2020	2/6/2020	COPD	DM	-	2/4/2020	2/6/2020	3	-	-	-	-	-	-	+	-
138	34271	J	71	M	PCCU	12/30/2019	1/13/2020	Embolic infarcts,VAP	DM HTN	-	12/30/2019	1/10/2020	12	-	-	-	-	-	+	+	-
139	891251	K	74	M	TICU	2/2/2020	2/8/2020	HCV reltd.cirrhosis	-	+	2/2/2020	2/8/2020	7	-	-	-	-	-	+	+	-
140	890614	O	55	M	PCCU	1/31/2020	2/2/2020	AFI	-	-	1/31/2020	2/2/2020	3	-	-	-	-	-	+	+	-

S no.	MRD	Initials	DATE OF COLLECTION	LAB ID	GRAM STAIN	TTP (HOURS)	TTP GROUP	ORGANISM	Time to BSI	CLABSI	TLC	fever	HR	RR	CRP	PCT	SOURCE OF INFECTION	MDR	XDR	PDR	MRSA	VRE	PROBABLE ESBL	CONFIRMED ESBL
71	857305	G	11/30/2019	24911	GPC	26	3	Staphylococcus aureus	4	NO	6.1	+	86	24	-	68.3	-	+	+	-	-	-	-	-
72	858092	S	11/30/2019	24181	GPC	15.5	2	Staphylococcus aureus	7	NO	8.9	-	72	18	-	8.5	-	-	-	-	+	-	-	-
73	857492	R	11/12/2019	24660	BYLC	-29	1	Candida gulliermondii	18	NO	10.7	-	84	18	-	5.6	-	-	-	-	-	-	-	-
74	856826	J	11/28/2019	24689	BYLC	C-12,P-17.5	2	Candida parapsilosis	10	NO	5.5	-	94	16	-	0.3	-	-	-	-	-	-	-	-
75	859288	B	11/30/2019	24940	GPC	17	2	Staphylococcus haemolyticus	29	NO	15.3	-	110	16	-	0.9	-	+	-	-	-	-	-	-
76	828904	A	12/8/2019	21713©,21714	GNB	C-5,P-26.5	1	Klebsiella pneumoniae	9	NO	10.2	-	100	14	-	5.5	Urine-Klebsiella	+	+	-	-	-	+	+
77	860133	N	12/2/2019	25066	GNB	21	2	Acinetobacter lwoffii	26	NO	19.3	+	70	14	-	0.2	-	+	-	-	-	-	-	-
78	796639	S	12/2/2019	25080	GNB	9	1	Pseudomonas aeruginosa	87	NO	15.1	-	66	16	-	-	Urine-Pseudo.aeruginosa	-	-	-	-	-	+	+
79	860130	G	12/2/2019	25068	GPC	9	1	Staphylococcus aureus	9	NO	17	-	86	20	-	45.6	-	-	-	-	+	-	-	-
80	860558	G	12/3/2019	24990	GNCB	16.5	2	Acinetobacter lwoffii	4	NO	10.8	-	95	18	-	-	-	-	-	-	-	-	+	+
81	863419	P	12/10/2019	C-25611,P-25612	GNB	C-14,P-20	2	E.coli	18	NO	7.2	-	70	16	-	100	-	+	-	-	-	-	+	+
82	828910	I	10/13/2019	21027	GPC	21	2	Staphylococcus epidermidis	18	NO	8.7	-	70	16	+	2.02	-	+	-	-	-	-	-	-
83	856172	J	12/9/2019	25567	GPC	6	1	Staphylococcus haemolyticus	7	NO	8.4	-	74	20	-	3.76	-	+	+	-	-	-	-	-
84	860785	P	12/3/2019	23936	GNB	18	2	Salmonella typhi	9	NO	18.5	+	74	22	-	-	-	+	+	-	-	-	+	-
85	866604	R	12/13/2019	25915, p-25916	GNCB	C-11,P-23.5	2	Acinetobacter baumannii	9	NO	41.5	-	80	24	-	0.7	-	+	-	-	-	-	-	-
86	843504	D	12/14/2019	24448	GNCB	12.5	2	Acinetobacter baumannii	8	NO	26.7	-	84	20	-	5.5	Urine-Acineto.baumannii	+	+	-	-	-	-	-
87	867174	B	12/15/2019	25500	GNB	16	2	Klebsiella pneumoniae	8	NO	21.4	-	84	14	-	13.5	Spt-Klebsiella	+	-	-	-	-	+	-
88	857541	M	11/27/2019	25141	GNB	13.5	2	E.coli	7	NO	14.3	-	100	16	-	0.5	-	+	-	-	-	-	+	-
89	865644	L	12/11/2019	24698©,24699(P)	GNB	C-10,P-12.5	1	Klebsiella pneumoniae	0	NO	12.4	-	72	20	-	1.5	-	-	-	-	-	-	-	-
90	843546	N	12/9/2019	25231	BYLC	6	1	Candida albicans	3	NO	11.4	-	76	22	-	9.5	-	-	-	-	-	-	-	-
91	867290	R	12/16/2019	25501	GNCB	14.5	2	Acinetobacter baumannii	10	NO	13.2	+	78	22	-	2.5	-	+	-	-	-	-	+	-
92	672925	S	12/19/2019	25582©,25583(P)	GNB	P-12.5,C-8	1	Klebsiella pneumoniae	23	NO	19.3	-	80	14	-	50.5	ET-Klebsiella(5452,16/6)	+	+	-	-	-	-	-
93	595981	G	12/20/2019	25007	GNCB	14.5	2	Acinetobacter baumannii	0	NO	18.2	-	84	16	-	0.3	-	+	-	-	-	-	-	-
94	870537	R	12/21/2019	25158©,25159(P)	GNB	C-12,P-17.5	2	Klebsiella pneumoniae	1	NO	8.7	-	86	20	+	1.6	-	+	+	-	-	-	+	+
95	861836	J	12/5/2019	25873	GNB	17	2	E.coli	17	NO	9.3	-	70	18	-	9.9	-	+	+	-	-	-	-	-
96	855024	P	2/10/2020	25151	GNB	19	2	Pseudomonas aeruginosa	10	NO	10.5	-	72	18	-	70	Urine Pseudomonas	+	+	-	-	-	+	+
97	55062	H	12/24/2019	25766©,25734(P)	GNB	C-20,P-14	2	Acinetobacter baumannii	1	NO	8.9	-	84	20	-	1.2	-	+	-	-	-	-	-	-
98	869559	A	12/19/2019	25455	GNB	23	2	E.coli	1	NO	9.6	-	88	22	-	30.03	-	+	+	-	-	-	+	-
99	84164	R	12/26/2019	25362	GNB	8.5	1	Pseudomonas aeruginosa	9	NO	13.3	-	70	19	-	1.6	ET-Pseudomonas	+	+	-	-	-	-	-
100	251907	A	12/27/2019	25042	BYLC	17	2	Candida albicans	0	NO	21.9	-	65	17	-	6.5	Urine-C.albicans	-	-	-	-	-	-	-
101	874183	K	12/27/2019	25056	GNB	8	1	Klebsiella pneumoniae	22	NO	30.3	-	65	20	+	1.27	-	+	-	-	-	-	+	+
102	866609	N	12/28/2019	25687	BYLC	15.5	2	Candida krusei	12	NO	10	+	74	21	-	1.1	-	-	-	-	-	-	-	-
103	739837	J	12/31/2019	25802	GPC	12.5	2	Staphylococcus aureus	11	NO	20.6	+	80	18	-	2.1	-	+	-	-	+	-	-	-
104	874396	A	12/31/2019	25559©,25560(P)	BYLC	C-21,P-17	2	Candida albicans	18	NO	13.3	-	96	15	-	1.8	Urine-C.albicans	-	-	-	-	-	-	-
105	875916	A	03-01-20202	158	GNCB	20.5	2	Acinetobacter baumannii	22	NO	8.6	-	110	20	-	37.7	-	+	-	-	-	-	-	-
106	875601	S	1/4/2020	191	GNB	9.5	1	E.coli	11	NO	20	-	94	16	-	100	-	+	-	-	-	-	+	-
107	874673	C	1/2/2020	72	GNB	6.5	1	Acinetobacter baumannii	15	NO	20.9	-	74	17	-	705	-	-	-	-	-	-	-	-
108	873200	V	1/5/2020	278	GNB	12	1	Klebsiella pneumoniae	23	YES	22.8	+	90	20	-	10	-	+	-	-	-	-	+	+
109	873654	T	1/5/2020	307	GNB	C-20,P-16	2	Acinetobacter baumannii	2	NO	12.8	-	72	16	-	0.53	-	+	-	-	-	-	+	+
110	873208	J	1/9/2020	525	GNB	17	2	Klebsiella pneumoniae	4	NO	22.1	-	60	18	-	51.21	Spt-Klebsiella	+	-	-	-	-	+	-
111	878975	S	1/10/2020	593	GNB	12	1	Klebsiella pneumoniae	4	NO	24.8	-	84	20	-	7.5	-	-	-	-	-	-	-	-
112	878990	A	1/11/2020	674	GNB	16	2	Acinetobacter baumannii	14	NO	18.7	-	86	15	-	3.03	-	+	+	-	-	-	+	+
113	873247	A	12/28/2019	26877	BYLC	11	1	Candida auris	12	NO	9.8	-	90	21	-	-	-	-	-	-	-	-	-	-
114	866185	S	1/14/2020	889	GNB	9	1	Elizabethkingia meningoseptica	18	YES	14.8	+	80	20	+	11	-	+	-	-	-	-	-	-
115	523274	U	1/10/2020	131	GNB	9	1	Acinetobacter baumannii	3	NO	17.9	-	104	20	-	0.75	-	+	-	-	-	-	-	-
116	29675	S	1/8/2020	250	GNB	14.5	2	Klebsiella pneumoniae	13	NO	9.9	-	74	16	-	-	Urine-Klebsiella	+	-	-	-	-	-	-
117	882795	K	1/18/2020	1202	GNB	27	3	E.coli	14	NO	40.8	+	84	18	-	2.98	-	+	-	-	-	-	-	-
118	882176	S	1/17/2020	1061	GNB	5.5	1	Klebsiella pneumoniae	18	NO	6.7	+	90	20	-	10.5	BAL-Klebsiella	+	+	-	-	-	+	+
119	884065	R	1/20/2020	1328	BYLC	13	2	Candida albicans	24	NO	19.5	-	70	14	-	1.49	-	-	-	-	-	-	-	-
120	884101	S	1/21/2020	1334	GNB	-16	1	Acinetobacter baumannii	14	NO	8.1	-	76	15	-	6.5	ET-Acinetobacter baumannii	+	-	-	-	-	-	-
121	873501	S	12/28/2019	26899	GPC	P-21,C-26.5	2	Staphylococcus aureus	17	NO	15.5	-	60	19	-	16.09	C.line tip-klebsiella(6904,30/7)	-	-	-	+	-	-	-
122	697331	R	1/24/2020	1200	GNB	15	2	Klebsiella pneumoniae	3	NO	9.5	-	72	20	+	0.61	Urine-Klebsiella	+	-	-	-	-	-	-
123	886544	A	1/24/2020	1667	GNB	17	2	Klebsiella pneumoniae	13	NO	35	+	84	20	-	4.5	C.line tip-klebsiella	+	-	-	-	-	-	-
124	886593	R	1/25/2020	1682	GNB	13	2	Acinetobacter baumannii	1	NO	25.3	+	86	22	-	4.28	ET-Acinetobacter baumannii	+	+	-	-	-	+	+
125	881091	T	1/15/2020	939	BYLC	21	2	Candida tropicalis	14	NO	25.6	-	90	14	-	27.7	-	-	-	-	-	-	-	-
126	887253	M	1/26/2020	1759	GPC	27	3	Staphylococcus aureus	43	NO	6.3	-	84	16	-	-	-	-	-	-	-	-	-	-
127	884723	H	1/24/2020	C-1614, p-1615	GPC	C-12, P-20	2	Staphylococcus aureus	1	NO	8.1	-	72	18	-	0.83	-	-	-	-	+	-	-	-
128	887231	M	1/24/2020	1610	GNB	17	2	Pseudomonas aeruginosa	6	NO	13.1	-	80	20	-	-	-	+	+	-	-	-	+	+
129	883391	K	2/6/2020	2542	GNCB	26	3	Acinetobacter baumannii	17	NO	11.4	-	64	20	-	3.82	-	+	+	-	-	-	-	-
130	880252	V	1/15/2020	969	GNCB	21	2	Acinetobacter baumannii	28	NO	23.5	+	82	21	-	13.7	-	+	+	-	-	-	+	-
131	153906	H	2/15/2020	3220	GNB	15.5	2	Acinetobacter baumannii	10	NO	23.5	+	70	21	-	1.2	-	+	+	-	-	-	-	-
132	880228	J	1/13/2020	864	GNB	22	2	Burkholderia cepacia	29	NO	12.5	-	74	19	-	1.19	-	+	+	-	-	-	-	-
133	888519	P	2/2/2020	2184	GNCB	c-18 P-20	2	Acinetobacter baumannii	9	NO	13.5	-	84	18	-	50.5	-	+	+	-	-	-	+	+
134	878423	S	1/9/2020	528	GNB	8	1	Klebsiella pneumoniae	26	NO	29.4	-	90	17	-	2.24	Spt/Wound swab-klebsiella	+	+	-	-	-	+	+
135	891287	S	2/9/2020	2719	GPC	19	2	Staphylococcus haemolyticus	87	NO	7.9	-	72	16	+	5.5	-	-	-	-	-	-	-	-
136	752997	G	2/3/2020	2308	GNB	14	2	Klebsiella pneumoniae	8	NO	7.8	-	76	15	-	1.3	Spt-Klebsiella	+	-	-	-	-	+	-
137	892093	S	2/4/2020	2371	GNB	9	1	E.coli	4	NO	8.5	-	110	16	-	100	-	+	+	-	-	-	+	+
138	34271	J	2/7/2020	2550	GNB	18	2	Pseudomonas aeruginosa	9	NO	12.4	-	100	18	-	-	ET-Pseudo	+	-	-	-	-	+	+
139	891251	K	2/3/2020	2279	GNB	13.5	2	E.coli	10	NO	20.6	+	84	19	-	4.5	-	+	-	-	-	-	-	-
140	890614	O	2/10/2020	2818	GNB	19	2	Klebsiella pneumoniae	18	NO	10.6	-	96	20	-	25.08	-	+	-	-	-	-	-	-

S no.	MRD	Initials	PROBABLE AmpC	CONFIRMED AmpC	PROBABLE MBL	CONFIRMED MBL	OUTCOME	AMP	P/T	CXM	CAZ	CTR	CFPZ+SB	CPM	ERT	IM	MM	DOR	AK	GEN	AMC	CIP	LEVO	TET	MIN	TGC	CX	COTRI	CX SCREEN	P	OXA	HLG	CD	ERY	LZD	VA	RA	TEICO	DAPTO	FLUCON	FLUCYT	AMP B	CASPO	VORI
71	857305	G	-	-	-	-	DAMA	-	-	-	-	-	-	-	-	-	-	-	-	R	-	R	R	S	-	-	-	R	-	S	S	-	S	R	R	S	S	R	R	-	-	-	-	-
72	858092	S	-	-	-	-	Expired	-	-	-	-	-	-	-	-	-	-	-	-	R	-	R	R	S	-	-	-	S	+	R	R	R	R	R	S	S	S	S	S	-	-	-	-	-
73	857492	R	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	S	R	S	S	S
74	856826	J	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	S	R	R	S	S
75	859288	B	-	-	-	-	DAMA	-	-	-	-	-	-	-	-	-	-	-	-	R	-	R	R	S	-	-	-	S	-	R	R	-	R	R	R	S	S	S	R	-	-	-	-	-
76	828904	A	-	-	+	-	DAMA	-	R	R	-	R	R	R	R	R	R	-	R	R	R	R	-	-	-	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
77	860133	N	-	-	-	-	Expired	R	R	-	R	R	S	S	-	R	R	-	S	S	R	R	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
78	796639	S	-	-	-	-	DAMA	R	S	-	R	R	R	R	-	R	R	R	R	R	R	R	R	-	R	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
79	860130	G	-	-	-	-	DAMA	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	R	S	-	-	-	R	+	R	R	S	R	R	S	S	S	S	S	-	-	-	-	-
80	860558	G	-	-	-	-	RECOVERED	R	S	-	S	R	S	S	-	S	R	-	S	S	S	S	S	-	S	S	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
81	863419	P	-	-	-	-	Expired	R	S	S	-	S	S	S	S	S	S	-	R	S	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
82	828910	I	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	R	S	-	-	-	R	+	R	S	-	S	R	S	S	R	S	S	-	-	-	-	-
83	856172	J	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	R	-	R	R	S	-	-	-	R	-	R	S	-	R	R	R	S	S	R	R	-	-	-	-	-
84	860785	P	-	-	+	+	Expired	R	R	-	R	-	R	R	-	R	R	R	R	R	R	R	R	-	R	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
85	866604	R	-	-	-	-	DAMA	R	R	-	R	R	S	R	-	R	R	-	S	S	S	S	S	-	S	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
86	843504	D	-	-	+	+	Expired	R	R	-	R	R	R	R	-	R	R	-	R	R	R	R	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
87	867174	B	-	-	+	-	DAMA	-	R	R	-	R	R	R	R	R	R	-	S	S	R	R	-	-	-	R	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
88	857541	M	-	-	-	-	Expired	R	S	R	-	R	S	S	R	S	S	-	S	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
89	865644	L	-	-	-	-	RECOVERED	-	S	S	-	S	S	S	S	S	S	-	S	S	S	S	-	-	-	S	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
90	843546	N	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	S	S	S	S	S
91	867290	R	-	-	+	-	DAMA	R	R	-	R	R	R	R	-	R	R	-	R	R	R	R	R	-	S	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
92	672925	S	-	-	+	+	Expired	-	R	R	-	R	R	R	R	R	R	-	R	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
93	595981	G	+	+	+	-	RECOVERED	R	R	-	R	R	R	R	-	R	R	-	R	R	R	R	R	-	S	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
94	870537	R	+	+	-	-	RECOVERED	-	S	R	-	R	R	R	R	R	R	-	R	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
95	861836	J	+	-	-	-	DAMA	R	R	R	-	R	R	R	R	S	R	-	S	R	R	R	-	-	-	S	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
96	855024	P	-	-	+	-	RECOVERED	R	S	-	R	R	S	R	-	R	R	R	S	S	R	R	R	-	R	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
97	55062	H	-	-	-	-	DAMA	R	R	-	R	R	R	R	-	R	R	-	R	S	R	R	R	-	R	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
98	869559	A	-	-	+	-	RECOVERED	S	R	R	-	R	R	R	R	R	R	-	S	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
99	84164	R	-	-	-	-	Expired	R	R	-	R	R	R	R	-	R	R	R	R	R	R	S	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
100	251907	A	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	S	S	S	S	S
101	874183	K	-	-	-	-	RECOVERED	-	R	R	-	R	R	R	R	R	R	-	R	R	R	R	-	-	-	S	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
102	866609	N	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	R	R	S	S	S
103	739837	J	-	-	-	-	Expired	-	-	-	-	-	-	-	-	-	-	-	-	R	-	R	R	R	-	-	-	R	+	R	R	-	R	R	S	S	R	S	S	-	-	-	-	-
104	874396	A	-	-	-	-	Expired	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	S	S	S	S	S
105	875916	A	-	-	-	-	RECOVERED	R	R	-	R	R	R	R	-	R	R	-	S	R	R	R	R	-	R	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
106	875601	S	-	-	-	-	RECOVERED	R	R	R	-	R	S	S	S	S	S	-	R	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
107	874673	C	-	-	-	-	Expired	R	R	-	R	R	R	R	-	R	R	-	S	R	R	S	S	-	R	S	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
108	873200	V	-	-	-	-	RECOVERED	-	S	R	-	R	R	R	R	R	R	-	S	S	R	R	-	-	-	-	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
109	873654	T	-	-	+	-	DAMA	R	R	-	R	R	R	R	-	R	R	-	R	R	R	R	-	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
110	873208	J	-	-	-	-	RECOVERED	-	S	R	-	R	S	S	S	S	S	-	S	R	S	S	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
111	878975	S	-	-	-	-	Expired	-	R	R	-	R	R	S	R	R	R	-	S	S	R	R	-	-	-	-	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
112	878990	A	-	-	+	+	RECOVERED	R	S	-	R	R	R	R	-	R	R	-	R	R	R	R	-	-	S	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
113	873247	A	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	S	S	S	S	S
114	866185	S	-	-	-	-	DAMA	R	R	-	R	R	R	R	-	R	R	-	R	R	R	R	R	-	S	R	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
115	523274	U	-	-	-	-	DAMA	R	S	-	R	R	S	R	-	R	R	-	R	S	R	R	R	-	S	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
116	29675	S	-	-	-	-	RECOVERED	-	S	S	-	R	S	S	S	S	S	-	S	S	S	S	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
117	882795	K	+	+	-	-	Expired	R	S	R	-	R	S	R	R	S	S	-	S	S	R	R	-	-	-	S	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
118	882176	S	-	-	+	-	RECOVERED	-	R	R	-	R	R	R	R	R	R	-	R	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
119	884065	R	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	S	S	S	S	S
120	884101	S	+	-	-	-	RECOVERED	R	S	-	R	R	S	R	-	S	R	-	S	S	S	R	-	-	S	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
121	873501	S	-	-	-	-	DAMA	-	-	-	-	-	-	-	-	-	-	-	-	R	-	R	R	S	-	-	-	S	+	R	R	-	R	S	R	S	S	S	R	-	-	-	-	-
122	697331	R	-	-	-	-	DAMA	-	R	R	-	R	R	R	R	R	R	-	S	R	R	R	-	-	-	-	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
123	886544	A	+	+	+	-	RECOVERED	-	R	R	-	R	R	R	R	R	R	-	R	R	R	R	-	-	-	S	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
124	886593	R	-	-	+	+	RECOVERED	R	S	-	R	R	R	R	-	R	R	-	R	R	R	R	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
125	881091	T	-	-	-	-	DAMA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	R	S	S	S	S
126	887253	M	-	-	-	-	Expired	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	R	S	-	-	-	R	-	R	S	-	S	S	R	S	S	S	S	-	-	-	-	-
127	884723	H	-	-	-	-	DAMA	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	R	S	-	-	-	S	+	R	R	-	S	R	R	S	R	R	S	-	-	-	-	-
128	887231	M	-	-	+	+	RECOVERED	R	S	-	S	R	S	R	-	R	R	R	S	S	R	R	R	-	R	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
129	883391	K	-	-	+	+	DAMA	S	R	-	R	R	R	R	-	R	R	-	R	R	R	R	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
130	880252	V	+	+	+	-	Expired	R	R	-	R	R	R	R	-	R	R	-	S	R	R	R	R	-	R	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
131	153906	H	-	-	-	-	RECOVERED	R	R	-	R	R	S	R	-	R	S	-	R	S	R	R	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
132	880228	J	-	-	-	-	RECOVERED	R	S	-	R	R	S	S	-	R	R	R	R	S	R	R	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
133	888519	P	+	+	+	-	Expired	R	S	-	R	R	R	R	-	R	R	-	R	R	R	R	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
134	878423	S	+	+	+	-	RECOVERED	-	S	R	-	R	R	R	R	R	R	-	R	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
135	891287	S	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	R	-	R	R	S	-	-	-	S	-	R	R	-	S	R	S	S	R	R	S	-	-	-	-	-
136	752997	G	-	-	+	-	DAMA	-	R	R	-	R	R	R	S	R	R	-	S	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
137	892093	S	-	-	+	+	DAMA	R	S	R	-	R	R	R	R	R	R	-	R	R	R	S	-	-	-	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
138	34271	J	+	+	+	-	RECOVERED	R	R	-	R	R	S	R	-	R	R	R	S	R	R	S	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
139	891251	K	-	-	-	-	RECOVERED	R	S	R	-	R	S	S	S	S	S	-	S	S	R	R	-	-	-	S	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
140	890614	O	-	-	-	-	RECOVERED	-	R	R	-	R	S	R	S	S	S	-	S	R	S	S	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

S no.	MRD	Initials	Age	Gender	AREA	DOA to hospital	DOD from hospital	Diagnosis	COMORBIDITY	Previous Hospitalization	DOA to ICU	DOD from ICU	ICU days	DOI OF CL	DOR OF CL	CL days	Indication of CL	CVC BLOOD	PER.LINE BLOOD	BLOOD CULTURE	CATHETER TIP
141	850120	R	57	M	PCCU	2/2/2020	2/22/2020	AFI	-	-	2/2/2020	2/12/2020	11	-	-	-	-	-	+	+	-
142	888856	B	62	M	SICU	1/29/2020	2/18/2020	RSA,HI	DM HTN	-	1/29/2020	2/15/2020	18	-	-	-	-	-	+	+	-
143	470330	K	60	F	MICU	1/17/2020	2/18/2020	Lt.MCA infarct	HTN	-	1/17/2020	2/10/2020	24	1/17/2020	1/30/2020	13	TPN	+	-	+	-
144	895106	S	45	M	PCCU	2/8/2020	2/12/2020	AFI,? pulm.koch's	-	+	2/8/2020	2/12/2020	5	-	-	-	-	-	+	+	-
145	183229	S	88	F	MICU	1/30/2020	2/17/2020	COPD	DM	-	1/30/2020	2/16/2020	18	2/2/2020	2/10/2020	8	TPN	+	-	+	-
146	872711	S	51	M	STICU	12/26/2019	30-02-2020	RSA	DM HTN	-	12/26/2019	1/30/2020	35	-	-	-	-	-	+	+	-
147	894661	S	63	F	PCCU	2/7/2020	2/22/2020	ICH	DM	-	2/8/2020	2/15/2020	8	-	-	-	-	-	+	+	-
148	896378	A	60	M	STICU	2/10/2020	3/3/2020	Hepatic encephalopathy	-	+	2/10/2020	2/23/2020	14	-	-	-	-	-	+	+	-
149	895451	K	70	M	PCCU	2/8/2020	2/18/2020	Unknown poisoning	DM	-	2/8/2020	2/18/2020	11	2/10/2020	2/15/2020	5	CVP monitoring	+	-	+	-
150	897069	S	27	M	MICU	2/11/2020	2/28/2020	Gastroenteritis	-	-	2/11/2020	2/20/2020	10	-	-	-	-	-	+	+	-
151	894094	G	53	M	SICU	2/11/2020	2/25/2020	BTA,Intestinal perforation	-	-	2/11/2020	2/23/2020	12	2/14/2020	2/21/2020	7	TPN	+	-	+	-
152	126819	S	67	F	MICU	3/3/2020	3/13/2020	Complicated falciparum malaria	-	-	3/3/2020	3/10/2020	20	-	-	-	-	-	+	+	-
153	910265	D	76	M	PCCU	3/4/2020	3/12/2020	Acute cholecystitis	-	+	3/4/2020	3/10/2020	5	3/4/2020	3/8/2020	4	CVP monitoring	+	-	+	-
154	332912	S	50	F	TICU	3/4/2020	3/14/2020	Pleural effusion	-	-	3/4/2020	3/14/2020	5	3/4/2020	3/10/2020	6	CVP monitoring	+	-	+	-
155	911611	K	55	M	MICU	3/6/2020	3/10/2020	Pneumonia	HTN	+	3/6/2020	3/10/2020	19	-	-	-	-	-	+	+	+
156	448467	V	54	F	PCCU	3/6/2020	3/26/2020	Rt.MCA infarct	DM HTN	-	3/6/2020	3/26/2020	16	-	-	-	-	-	+	+	-
157	904687	S	74	M	PCCU	3/7/2020	3/25/2020	AFI	-	+	3/7/2020	3/25/2020	17	3/7/2020	3/20/2020	13	CVP monitoring	+	-	+	-
158	912877	H	45	M	MICU	3/14/2020	3/30/2020	RSA,HI	DM HTN	-	3/14/2020	3/30/2020	17	3/14/2020	3/25/2020	9	CVP monitoring	+	-	+	-
159	891780	B	49	F	STICU	3/11/2020	3/20/2020	Acute bact.pneumonia	-	-	3/11/2020	3/20/2020	19	-	-	-	-	-	+	+	-
160	907900	G	44	M	NSICU	3/9/2020	3/27/2020	Myasthenia Gravis	DM	-	3/9/2020	3/27/2020	19	3/10/2020	3/17/2020	7	TPN	+	+	+	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
161	912978	N	58	M	MICU	3/10/2020	3/31/2020	Rt.MCA infarct	-	-	3/10/2020	3/31/2020	16	3/12/2020	3/30/2020	18	TPN	+	+	+	-
162	702308	S	45	M	PCCU	3/13/2020	3/25/2020	Gall stone pancreatitis	HTN	-	3/13/2020	3/25/2020	25	-	-	-	-	-	+	+	-
163	916187	R	23	M	MICU	3/14/2020	3/25/2020	Bronchial asthma,COPD	-	-	3/14/2020	3/25/2020	1	-	-	-	-	-	+	+	-
164	916639	P	54	M	MICU	3/15/2020	3/31/2020	RSA	HTN	-	3/15/2020	3/31/2020	19	3/15/2020	3/31/2020	15	TPN	+	+	+	-
165	917494	J	75	M	PCCU	3/17/2020	3/25/2020	Chr.asthma	DM	-	3/17/2020	3/25/2020	8	3/17/2020	3/20/2020	3	TPN	+	-	+	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
166	658761	H	19	M	STICU	3/19/2020	3/24/2020	Acute pancreatitis	-	-	3/19/2020	3/24/2020	10	-	-	-	-	-	+	+	-
167	913775	V	45	M	MICU	3/10/2020	3/30/2020	RSA	HTN	-	3/10/2020	3/30/2020	20	3/10/2020	3/20/2020	10	TPN	+	+	+	-
168	920523	H	25	M	SICU	3/27/2020	3/28/2020	Hepatic encephalopathy	-	-	3/27/2020	3/28/2020	21	-	-	-	-	-	+	+	+
169	915474	G	50	M	MICU	3/28/2020	3/30/2020	AFI,TCP,resp.failure	-	-	3/28/2020	3/30/2020	14	-	-	-	-	-	+	+	-
170	158446	R	34	F	MICU	3/28/2020	4/10/2020	Pneumonia	DM	-	3/28/2020	4/10/2020	6	3/28/2020	4/5/2020	8	TPN	+	+	+	-
171	824379	S	63	F	STICU	3/28/2020	4/5/2020	Acute cholecystitis	HTN	-	3/28/2020	4/5/2020	39	-	-	-	-	-	+	+	-
172	916686	D	51	M	PCCU	3/15/2020	3/25/2020	Diabetic ketoacidosis	DM	-	3/15/2020	3/25/2020	22	-	-	-	-	-	+	+	-
173	920980	L	53	M	MICU	4/1/2020	4/20/2020	Meningitis	-	+	4/1/2020	4/20/2020	29	4/1/2020	4/15/2020	15	TPN	+	-	+	-
174	181220	M	53	F	TICU	4/3/2020	4/23/2020	CLD,Hepatic encephalothy	DM	+	4/3/2020	4/23/2020	19	-	-	-	-	-	+	+	-
175	895036	B	65	M	PCCU	4/4/2020	4/15/2020	Complicated falciparum malaria	-	-	4/4/2020	4/15/2020	20	-	-	-	-	-	+	+	-
176	458421	G	40	F	MICU	4/4/2020	4/24/2020	CA adrenal,UTI	-	-	4/4/2020	4/24/2020	18	-	-	-	-	-	+	+	-
177	688455	R	46	F	MICU	4/4/2020	4/28/2020	RSA,BTC	-	-	4/4/2020	4/28/2020	14	4/4/2020	4/24/2020	10	TPN	+	+	+	-
178	920436	R	60	M	STICU	3/28/2020	4/15/2020	Encephalothy, hepatic failure	-	-	3/28/2020	4/15/2020	30	3/28/2020	4/5/2020	8	TPN	+	+	+	-
179	921224	H	30	M	SICU	4/4/2020	4/10/2020	ALD,ascites	DM	-	4/4/2020	4/10/2020	16	-	-	-	-	-	+	+	-
180	580853	J	58	M	NSICU	4/4/2020	4/12/2020	Acute pancreatitis	DM	-	4/4/2020	4/12/2020	3	4/4/2020	4/10/2020	6	TPN	+	+	+	-
181	766953	S	26	F	MICU	4/7/2020	4/11/2020	AFI	DM	-	4/7/2020	4/11/2020	2	-	-	-	-	-	+	+	-
182	885024	V	62	M	MICU	4/6/2020	4/15/2020	Acute pancreatitis	DM HTN	-	4/6/2020	4/15/2020	29	-	-	-	-	-	+	+	-
183	920965	R	84	M	PCCU	4/6/2020	4/30/2020	Electrical burns	-	-	4/6/2020	4/30/2020	28	-	--	-	-	-	+	+	+
184	921431	D	60	F	MICU	4/7/2020	4/15/2020	Bronchial asthma	-	+	4/7/2020	4/15/2020	13	-	-	-	-	-	+	+	-
185	921240	S	50	M	TICU	4/7/2020	4/30/2020	RSA,HI	-	-	4/7/2020	4/30/2020	35	-	-	-	-	-	+	+	-
186	891945	R	60	M	STICU	5/2/2020	5/30/2020	RSA	-	-	5/2/2020	5/30/2020	30	-	-	-	-	-	+	+	-
187	920524	H	61	M	SICU	4/14/2020	4/25/2020	Necrotizing fascitis	DM	-	4/14/2020	4/20/2020	3	-	-	-	-	-	+	+	-
188	901564	H	55	M	MICU	5/9/2020	5/18/2020	Fall from height	-	-	5/9/2020	5/15/2020	21	5/9/2020	5/15/2020	6	TPN	+	+	+	-
189	921133	S	62	M	TICU	5/9/2020	5/15/2020	Aspiration pneumonia	-	-	5/9/2020	5/15/2020	22	-	-	-	-	-	+	+	-
190	921659	M	47	F	TICU	5/9/2020	5/14/2020	Acute cholecystitis	-	-	5/9/2020	5/13/2020	15	5/9/2020	5/13/2020	4	TPN	+	+	+	-
191	911167	S	65	F	PCCU	5/11/2020	5/30/2020	Flame burns	-	-	5/11/2020	5/25/2020	5	-	-	-	-	-	+	+	-
192	921766	J	56	M	SICU	5/12/2020	5/20/2020	Paralytic ileus	DM	-	5/15/2020	5/20/2020	10	-	-	-	-	-	+	+	-
193	63226	M	45	M	NSICU	5/11/2020	5/20/2020	Distal ileal shunt	-	-	5/15/2020	5/11/2020	12	5/15/2020	5/20/2020	5	TPN	+	-	+	-
194	921932	S	25	M	TICU	5/16/2020	5/26/2020	VSD	DM HTN	-	5/16/2020	5/20/2020	4	5/16/2020	5/20/2020	4	CVP monitoring	+	-	+	-
195	921990	J	64	F	TICU	5/16/2020	5/30/2020	RSA,HI	DM HTN	-	5/16/2020	5/25/2020	12	-	-	-	-	-	+	+	-
196	921242	N	65	F	MICU	5/20/2020	6/5/2020	Rt.MCA infarct	HTN	-	5/22/2020	5/3/2020	7	5/22/2020	5/30/2020	8	CVP monitoring	+	+	+	-
197	922017	P	25	M	MICU	5/20/2020	5/30/2020	ALD,ascites	-	-	5/20/2020	5/25/2020	17	5/20/2020	5/25/2020	5	CVP monitoring	+	-	+	+
198	922018	R	30	F	MICU	5/22/2020	6/15/2020	Lt.MCA infarct	HTN	-	5/23/2020	5/10/2020	7	-	-	-	-	-	+	+	-
199	922007	J	64	F	PCCU	4/12/2020	4/20/2020	Infective endocarditis	HTN	-	4/13/2020	4/20/2020	8	-	-	-	-	-	+	+	-
200	190060	R	35	F	PCCU	4/12/2020	4/30/2020	Rt.MCA infarct	DM HTN	+	4/12/2020	4/25/2020	44	-	-	-	-	-	+	+	-
201	922050	B	54	F	SICU	4/12/2020	5/5/2020	Lung CA	-	+	4/15/2020	5/20/2020	30	4/15/2020	5/20/2020	5	TPN	+	+	+	-
202	169728	H	57	M	SICU	4/14/2020	4/20/2020	Fall from height	-	-	4/14/2020	4/18/2020	24	-	-	-	-	-	+	+	-
203	920894	Y	52	M	NSICU	4/12/2020	4/25/2020	VSD	HTN	-	4/14/2020	4/24/2020	20	4/14/2020	4/20/2020	6	TPN	+	-	+	-
204	921523	H	40	M	TICU	4/11/2020	4/30/2020	RSA,HI	-	-	4/11/2020	4/25/2020	10	4/12/2020	4/20/2020	8	TPN	+	+	+	+
205	426738	D	52	F	PCCU	3/25/2020	4/5/2020	Flame burns	DM	-	3/25/2020	4/1/2020	26	-	-	-	-	-	+	+	-
206	320734	V	85	M	MICU	5/16/2020	5/30/2020	RSA,SDH,ICH	HTN	-	5/16/2020	5/25/2020	25	-	-	-	-	-	+	+	-
207	638536	R	65	M	MICU	6/17/2020	6/25/2020	ALD	-	-	6/20/2020	6/24/2020	25	-	-	-	-	-	+	+	-
208	922510	S	60	F	SICU	6/17/2020	6/20/2020	Asthma	-	-	6/17/2020	6/20/2020	7	-	-	-	-	-	+	+	-

S no.	MRD	Initials	DATE OF COLLECTION	LAB ID	GRAM STAIN	TTP (HOURS)	TTP GROUP	ORGANISM	Time to BSI	CLABSI	TLC	fever	HR	RR	CRP	PCT	SOURCE OF INFECTION	MDR	XDR	PDR	MRSA	VRE	PROBABLE ESBL	CONFIRMED ESBL
141	850120	R	2/15/2020	2900	GPC	21.5	2	Staphylococcus haemolyticus	8	NO	11	-	90	21	-	18.38	-	+	-	-	-	-	-	-
142	888856	B	2/8/2020	2671	GNB	9	1	Acinetobacter baumannii	5	NO	10.5	-	60	22	-	0.4	-	+	+	-	-	-	-	-
143	470330	K	2/8/2020	2770	GNB	22	2	E.coli	22	NO	10.1	-	72	22	-	-	-	+	+	-	-	-	+	-
144	895106	S	2/9/2020	2757	GNB	23	2	Klebsiella pneumoniae	12	NO	19.5	-	84	24	-	1.54	-	+	+	-	-	-	+	+
145	183229	S	2/10/2020	2819	BYLC	9	1	Candida albicans	12	NO	15.6	-	90	22	-	2.61	Urine-C.tropcialis(13551,7/9)	-	-	-	-	-	-	-
146	872711	S	1/10/2020	610	GNCB	17	2	Acinetobacter baumannii	5	NO	14.2	-	74	24	+	1.6	Tissue-Acineto.baum(8242,4/9)	+	-	-	-	-	-	-
147	894661	S	2/10/2020	2789	GNB	36	3	Klebsiella pneumoniae	12	NO	7.2	-	86	21	-	0.92	Oral secrn-Klebsiella	+	-	-	-	-	+	-
148	896378	A	2/24/2020	3808	GNB	14	2	Serratia marscenses	4	NO	30.8	+	80	21	-	3.2	BAL-Serratia marscenses	+	-	-	-	-	-	-
149	895451	K	2/11/2020	2904	GNB	-21	1	Enterobacter cloacae	14	NO	16.8	-	72	14	-	1.5	-	+	+	-	-	-	-	-
150	897069	S	2/13/2020	3039	GPC	11	1	Staphylococcus aureus	22	NO	53.8	-	70	16	-	1.82	-	-	-	-	-	-	-	-
151	894094	G	2/17/2020	3335	BYLC	14	2	Candida albicans	14	YES	18.5	+	100	20	-	100	-	-	-	-	-	-	-	-
152	126819	S	3/3/2020	4355	GNB	17	2	Achromobacter xylosans	9	NO	49	-	66	18	-	0.53	ET-Achromobacter xylosans	+	-	-	-	-	+	-
153	910265	D	3/4/2020	4418	GNB	13	2	Klebsiella pneumoniae	22	NO	8.2	-	70	23	-	28.65	-	-	-	-	-	-	-	-
154	332912	S	3/4/2020	4500	GNCB	17	2	Acinetobacter baumannii	31	NO	10.4	-	72	22	-	-	Urine-Acineto.baum	+	+	-	-	-	+	+
155	911611	K	3/6/2020	4624	GNB	15.5	2	E.coli	18	NO	12.3	-	84	22	+	1.37	C.line tip-E.coli	+	-	-	-	-	-	-
156	448467	V	3/6/2020	4582	GNB	23	2	Klebsiella pneumoniae	11	NO	27.9	+	90	21	-	2.77	Urine/ET-Klebsiella	+	-	-	-	-	-	-
157	904687	S	3/7/2020	4686	GNB	21	2	Klebsiella pneumoniae	1	NO	20.3	+	84	20	-	3.3	-	+	+	-	-	-	-	-
158	912877	H	3/14/2020	5168	GNB	27	3	Klebsiella pneumoniae	8	NO	15.4	-	92	18	-	1.53	-	+	+	-	-	-	-	-
159	891780	B	3/11/2020	4957	GPC	18	2	Enterococcus faecium	8	NO	29.3	-	100	16	-	2.6	-	+	-	-	-	+	-	-
160	907900	G	3/9/2020	4799©,4800(P)	GPC	C-19,P-12	2	Enterococcus faecium	10	NO	23.5	-	90	18	-	1.07	ET-Enterococcus faecium	-	-	-	-	-	-	-
-	-	-	-	-	BYLC	-	2	Candida tropicalis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
161	912978	N	3/10/2020	4861	GPC	19	2	Staphylococcus aureus	1	NO	19.5	-	82	20	-	10.06	-	+	-	-	+	-	-	-
162	702308	S	3/13/2020	5119	GNB	9.5	1	Klebsiella pneumoniae	16	NO	14.8	-	72	19	-	100	Urine-Klebsiella pneumoniae	+	-	-	-	-	+	+
163	916187	R	3/14/2020	5147	GPC	6	1	Staphylococcus aureus	3	NO	22.1	+	70	18	-	1.79	-	+	-	-	-	-	-	-
164	916639	P	3/15/2020	5234	GNB	20.5	2	Stenotrophomonas maltophilia	1	NO	14	+	66	16	-	3.4	-	+	+	-	-	-	-	-
165	917494	J	3/17/2020	5318	GNB	23	2	Klebsiella pneumoniae	19	NO	16	-	85	20	-	46.15	-	+	-	-	-	-	-	-
-	-	-	-	-	GNB	-	2	Proteus mirabilis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
166	658761	H	3/19/2020	5565	GPC	16	2	Staphylococcus haemolyticus	20	NO	23.5	+	74	22	-	0.86	-	+	-	-	-	-	-	-
167	913775	V	3/10/2020	4873	GPC	15	2	Staphylococcus aureus	44	NO	16.7	-	84	18	-	1.13	-	-	-	-	-	-	-	-
168	920523	H	3/27/2020	5922	GPC	23	2	Staphylococcus aureus	20	NO	20	-	90	16	-	19.1	-	-	-	-	-	-	-	-
169	915474	G	3/28/2020	5954	BYLC	14	2	Candida albicans	9	NO	13.6	-	72	18	-	100	-	-	-	-	-	-	-	-
170	158446	R	3/28/2020	5959	GNB	8.5	1	E.coli	15	NO	11.9	-	60	20	-	100	-	+	-	-	-	-	+	-
171	824379	S	3/28/2020	5900	GNB	27	3	Klebsiella pneumoniae	10	NO	7.8	-	66	22	-	6.5	-	+	+	-	-	-	+	+
172	916686	D	3/15/2020	5242	GPC	13	2	Staphylococcus aureus	23	NO	5.6	-	84	22	-	3.7	-	+	-	-	+	-	-	-
173	920980	L	4/1/2020	6107	GNB	12	1	E.coli	20	NO	17.8	-	92	21	-	11.24	CSF/ET-Klebsiella	+	+	-	-	-	+	+
174	181220	M	4/3/2020	6155	GPC	14.5	2	Staphylococcus epidermidis	12	NO	22	-	72	16	-	7.26	-	-	-	-	-	-	-	-
175	895036	B	4/4/2020	6173	GNB	18.5	2	Klebsiella pneumoniae	18	NO	15	+	72	18	-	1.21	-	+	-	-	-	-	+	-
176	458421	G	4/4/2020	6180	GNB	16	2	E.coli	7	NO	6.1	-	84	19	-	100	-	+	-	-	-	-	-	-
177	688455	R	4/4/2020	6181	GNB	20.5	2	E.coli	4	NO	12.2	+	74	20	-	28.1	-	+	+	-	-	-	+	-
178	920436	R	3/28/2020	5969	GNB	11	1	E.coli	2	NO	15	+	85	20	-	6.05	-	+	+	-	-	-	+	-
179	921224	H	4/4/2020	6193c,6194p	GPC	C-9,P-12	1	Enterococcus faecium	20	NO	6.8	-	96	20	-	7.7	Spt-Enterococcus faecium	-	-	-	-	+	-	-
180	580853	J	4/4/2020	6200	GNB	24	2	Klebsiella pneumoniae	15	NO	11.6	+	82	22	-	31.6	-	+	+	-	-	-	+	-
181	766953	S	4/7/2020	6199	GNB	12	1	Sphingomonas paucimobilis	35	NO	20.5	+	72	24	-	4.2	-	+	-	-	-	-	-	-
182	885024	V	4/6/2020	6245	GNB	7.5	1	E.coli	12	NO	10.9	-	82	24	-	100	Pancreatic fl-E,coli	+	+	-	-	-	+	-
183	920965	R	4/6/2020	6261	GNB	21	2	Klebsiella pneumoniae	20	NO	13.8	-	84	20	-	2.2	Wound swab/Tissue/C.line tip-Kleb,Prot. Mirabills	+	-	-	-	-	+	-
184	921431	D	4/7/2020	6275	GPC	19	2	Staphylococcus aureus	8	NO	10	-	60	18	-	50.24	-	-	-	-	+	-	-	-
185	921240	S	4/7/2020	6279	GPC	26	3	Staphylococcus aureus	12	NO	10.3	-	90	18	+	34.83	-	-	-	-	-	-	-	-
186	891945	R	5/2/2020	7114	GNCB	17.5	2	Acinetobacter lwoffii	14	NO	7.5	-	110	18	-	-	-	+	-	-	-	-	+	-
187	920524	H	4/14/2020	6519	GNCB	17.5	2	Acinetobacter baumannii	9	NO	6.5	-	84	16	-	1.5	-	+	+	-	-	-	+	+
188	901564	H	5/9/2020	7342	GNB	11	1	E.coli	1	NO	16.7	+	72	19	-	4.4	Urine-E.coli	+	-	-	-	-	+	-
189	921133	S	5/9/2020	7500	GNCB	19	2	Acinetobacter baumannii	10	NO	18.6	+	60	17	-	50	-	+	-	-	-	-	+	-
190	921659	M	5/9/2020	7959(P)/7960©	GNB	P-14,C,19.5	2	Klebsiella pneumoniae	15	NO	10.5	-	84	17	-	0.59	-	+	-	-	-	-	-	-
191	911167	S	5/11/2020	7056	GNB	6.5	1	Enterobacter cloacae	24	NO	15.6	-	90	20	-	15.5	-	+	+	-	-	-	-	-
192	921766	J	5/12/2020	7680	GNCB	14	2	Acinetobacter baumannii	18	NO	33.6	+	76	20	-	4.5	-	+	+	-	-	-	+	-
193	63226	M	5/11/2020	7798	BYLC	22	2	Candida tropicalis	20	NO	25.6	+	85	20	-	3.18	-	-	-	-	-	-	-	-
194	921932	S	5/16/2020	7556	GNB	27	3	E.coli	8	NO	18.6	-	74	14	-	15.5	-	+	+	-	-	-	-	-
195	921990	J	5/16/2020	7108©,7109(P)	GNB	P-21,C-25	2	Klebsiella pneumoniae	10	NO	38.5	-	76	15	-	0.5	Wound swab-Klebsiella	+	+	-	-	-	-	-
196	921242	N	5/20/2020	7614©,7615(P)	GNB	P-17,C-22	2	Klebsiella pneumoniae	13	NO	20.6	-	80	15	-	-	ET-Klebsiella	+	+	-	-	-	+	+
197	922017	P	5/20/2020	7381	GNB	19	2	E.coli	25	NO	3.3	-	82	15	-	11.5	-	+	+	-	-	-	+	-
198	922018	R	5/22/2020	7958	GNB	9	1	Klebsiella pneumoniae	30	NO	5.5	+	84	16	-	0.3	-	+	-	-	-	-	+	+
199	922007	J	4/12/2020	6448	GPC	21	2	Staphylococcus epidermidis	11	NO	12.5	+	96	16	-	-	Pleural fl Pseudomonas	+	-	-	-	-	-	-
200	190060	R	4/12/2020	6467	GNB	17	2	Achromobacter xylosans	9	NO	11.6	-	110	18	-	15.18	Urine-Achromobacter xylosans	+	-	-	-	-	+	-
201	922050	B	4/12/2020	6473	GNB	-29.5	1	E.coli	18	NO	6.8	-	78	20	-	100	-	+	+	-	-	-	+	-
202	169728	H	4/14/2020	6546	GNB	11	1	E.coli	6	NO	8.6	-	85	22	-	0.15	ET-E.coli	+	-	-	-	-	-	-
203	920894	Y	4/12/2020	6442	GNB	14	2	Klebsiella pneumoniae	20	NO	7.9	-	72	24	-	4.95	-	+	-	-	-	-	+	-
204	921523	H	4/11/2020	6429	GNB	P-17,C-24	2	Klebsiella pneumoniae	35	NO	6.6	-	70	21	-	100	ET/C.line tip-Klebsiella	+	+	-	-	-	+	+
205	426738	D	3/25/2020	5871	GPC	16.5	2	Enterococcus faecium	20	NO	19.7	+	80	20	-	0.85	-	+	-	-	-	+	-	-
206	320734	V	5/16/2020	6590	GPC	13.5	2	Staphylococcus epidermidis	24	NO	45.6	+	76	23	-	0.63	-	+	-	-	-	-	-	-
207	638536	R	6/17/2020	6949	GNB	18	2	Klebsiella pneumoniae	15	NO	8.4	-	70	23	-	0.02	Urine-Klebsiella	+	+	-	-	-	-	-
208	922510	S	6/17/2020	7500	GNB	9	1	E.coli	9	NO	16.3	-	72	24	+	-	-	+	-	-	-	-	-	-

S no.	MRD	Initials	PROBABLE AmpC	CONFIRMED AmpC	PROBABLE MBL	CONFIRMED MBL	OUTCOME	AMP	P/T	CXM	CAZ	CTR	CFPZ+SB	CPM	ERT	IM	MM	DOR	AK	GEN	AMC	CIP	LEVO	TET	MIN	TGC	CX	COTRI	CX SCREEN	P	OXA	HLG	CD	ERY	LZD	VA	RA	TEICO	DAPTO	FLUCON	FLUCYT	AMP B	CASPO	VORI
141	850120	R	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	R	-	R	R	S	-	-	-	R	-	R	R	-	-	R	R	S	R	R	S	-	-	-	-	-
142	888856	B	+	+	+	-	RECOVERED	R	R	-	R	R	R	R	-	R	R	-	R	R	R	R	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
143	470330	K	-	-	+	+	RECOVERED	R	S	R	-	R	R	R	R	S	S	-	R	R	R	R	-	-	-	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
144	895106	S	-	-	+	-	DAMA	-	S	R	-	R	R	R	S	R	R	-	R	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
145	183229	S	-	-	-	-	Expired	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	S	S	S	S	S
146	872711	S	+	-	+	-	RECOVERED	R	R	-	R	R	R	R	-	R	R	-	S	R	R	R	-	S	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
147	894661	S	-	-	+	-	RECOVERED	-	R	R	-	R	R	R	R	R	R	-	S	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
148	896378	A	+	+	-	-	RECOVERED	R	S	-	R	R	R	S	-	S	S	-	S	R	S	S	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
149	895451	K	-	-	+	-	Expired	R	R	-	R	R	R	R	-	R	R	R	R	R	R	R	R	-	R	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
150	897069	S	-	-	-	-	Expired	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	R	S	-	-	-	S	-	R	S	-	S	R	R	S	R	S	S	-	-	-	-
151	894094	G	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	S	S	S	S	S
152	126819	S	-	-	+	-	DAMA	R	R	-	S	R	S	R	-	R	R	R	S	R	R	R	R	-	S	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
153	910265	D	-	-	-	-	DAMA	-	R	R	-	R	R	R	R	R	R	-	S	R	R	R	-	-	-	-	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
154	332912	S	+	+	+	-	DAMA	R	R	-	R	R	R	R	-	R	R	-	R	R	R	R	R	-	R	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
155	911611	K	-	-	-	-	RECOVERED	R	R	R	-	R	S	S	R	R	R	-	S	R	S	R	-	-	-	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
156	448467	V	+	-	-	-	RECOVERED	-	R	R	-	R	R	R	R	S	S	-	S	R	R	R	-	-	-	S	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
157	904687	S	+	-	+	-	RECOVERED	-	R	R	-	R	R	R	R	R	R	-	R	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
158	912877	H	-	-	+	+	Expired	-	R	R	-	R	R	R	R	R	R	-	S	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
159	891780	B	-	-	-	-	DAMA	-	-	-	-	-	-	-	-	-	-	-	-	R	-	R	R	S	-	-	-	R	-	R	-	S	-	R	S	R	-	S	R	-	-	-	-
160	907900	G	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	R	-	R	R	R	-	-	-	R	-	R	-	S	S	S	-	R	R	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	S	S	S	S	S
161	912978	N	-	-	-	-	DAMA	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	R	S	-	-	-	R	+	R	R	-	R	S	S	S	S	S	R	-	-	-	-
162	702308	S	-	-	+	-	Expired	-	R	R	-	R	R	R	R	R	R	-	R	R	R	R	-	-	-	S	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
163	916187	R	-	-	-	-	Expired	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	R	R	-	-	-	S	-	R	S	S	R	R	S	S	S	S	R	-	-	-	-
164	916639	P	-	-	+	-	DAMA	R	S	-	S	R	R	S	-	R	R	-	S	R	R	R	R	-	R	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
165	917494	J	-	-	-	-	DAMA	-	S	R	-	R	S	S	S	S	S	-	S	R	R	R	-	-	-	S	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
166	658761	H	-	-	-	-	Expired	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	R	R	-	-	-	R	-	R	S	R	S	R	S	S	S	R	-	-	-	-	-
167	913775	V	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	S	S	-	-	-	R	-	S	S	S	R	R	S	S	S	S	R	-	-	-	-
168	920523	H	-	-	-	-	DAMA	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	R	R	-	-	-	S	-	S	S	S	R	R	S	S	S	S	S	-	-	-	-
169	915474	G	-	-	+	-	Expired	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	S	S	S	S	S
170	158446	R	-	-	-	-	DAMA	R	R	R	-	R	R	R	R	S	S	-	S	S	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
171	824379	S	+	+	-	-	RECOVERED	-	S	R	-	R	R	R	R	R	R	-	S	R	R	R	-	-	-	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
172	916686	D	-	-	-	-	DAMA	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	R	R	-	-	-	S	+	R	R	-	R	R	S	S	R	R	S	-	-	-	-
173	920980	L	-	-	+	-	RECOVERED	R	R	R	-	R	S	R	R	R	R	-	R	R	S	R	-	-	-	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
174	181220	M	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	R	S	-	-	-	R	-	R	S	-	R	R	R	S	S	S	-	-	-	-	-
175	895036	B	-	-	-	-	RECOVERED	-	S	R	-	R	S	R	S	S	S	-	S	S	R	S	-	-	-	S	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
176	458421	G	-	-	-	-	Expired	R	R	R	-	R	R	R	S	S	S	-	R	R	S	S	-	-	-	R	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
177	688455	R	+	-	-	-	RECOVERED	R	R	R	-	R	R	R	R	S	S	-	S	S	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
178	920436	R	-	-	+	-	RECOVERED	R	R	R	-	R	S	R	R	R	R	-	R	R	R	R	-	-	-	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
179	921224	H	-	-	-	-	Expired	-	-	-	-	-	-	-	-	-	-	-	-	R	-	R	R	S	-	-	-	R	-	R	-	S	-	R	S	R	-	S	R	-	-	-	-
180	580853	J	-	-	-	-	Expired	-	R	R	-	R	R	R	R	R	R	-	S	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
181	766953	S	-	-	-	-	DAMA	R	R	-	S	R	R	R	-	R	R	R	S	R	S	S	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
182	885024	V	-	-	+	+	Expired	R	R	R	-	R	R	R	R	R	R	-	R	R	R	R	-	-	-	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
183	920965	R	-	-	-	-	Expired	-	R	R	-	R	R	S	S	S	S	-	R	R	R	R	-	-	-	S	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
184	921431	D	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	R	-	R	R	S	-	-	-	S	+	R	R	-	R	R	S	S	S	S	S	-	-	-	-
185	921240	S	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	R	S	-	-	-	R	-	S	S	-	R	R	S	S	S	S	S	-	-	-	-
186	891945	R	-	-	+	-	RECOVERED	R	R	-	R	R	S	R	-	R	S	-	S	S	R	S	S	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
187	920524	H	+	-	+	-	Expired	R	R	-	R	R	R	R	-	R	R	-	R	R	R	R	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
188	901564	H	-	-	+	-	RECOVERED	R	R	R	-	R	R	R	R	S	S	-	S	R	R	R	-	-	-	S	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
189	921133	S	-	-	+	-	RECOVERED	R	R	-	R	R	S	R	-	R	R	-	S	R	R	S	S	-	S	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
190	921659	M	+	+	+	-	RECOVERED	-	R	R	-	R	R	R	R	R	R	-	R	R	R	R	-	-	-	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
191	911167	S	-	-	+	-	Expired	R	R	-	R	R	R	R	-	R	R	R	R	R	R	R	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
192	921766	J	+	+	+	-	Expired	R	R	-	R	R	R	R	-	R	R	-	R	R	R	R	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
193	63226	M	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	R	S	S	S	S
194	921932	S	+	+	+	-	DAMA	R	R	R	-	R	S	R	R	R	S	-	S	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
195	921990	J	+	+	+	-	DAMA	-	R	R	-	R	R	R	R	S	R	-	R	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
196	921242	N	-	-	+	-	Expired	-	S	R	-	R	R	R	R	R	R	-	R	R	R	R	-	-	-	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
197	922017	P	+	+	+	-	RECOVERED	R	R	R	-	R	R	R	R	R	R	-	R	R	R	R	-	-	-	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
198	922018	R	-	-	+	-	Expired	-	R	R	-	R	R	R	R	R	R	-	S	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
199	922007	J	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	R	-	R	R	S	-	-	-	S	-	R	S	-	R	-	R	-	R	S	S	-	-	-	-
200	190060	R	-	-	+	+	RECOVERED	R	R	-	R	R	R	R	-	R	R	-	S	R	R	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
201	922050	B	-	-	+	+	DAMA	R	R	R	-	R	R	R	R	R	R	-	S	S	R	R	-	-	-	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
202	169728	H	-	-	+	-	RECOVERED	R	R	-	-	R	S	S	R	R	R	-	R	R	R	R	-	-	-	S	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
203	920894	Y	-	-	+	-	RECOVERED	-	R	R	-	R	R	S	R	S	S	-	R	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
204	921523	H	-	-	+	-	RECOVERED	-	R	R	-	R	R	R	R	R	R	-	S	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
205	426738	D	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	R	-	R	R	R	-	-	-	R	-	R	-	R	-	R	S	R	-	S	R	-	-	-	-
206	320734	V	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	R	S	-	-	-	R	-	R	S	-	R	S	R	R	S	S	S	-	-	-	-
207	638536	R	+	+	+	-	Expired	-	R	R	-	R	R	R	R	R	R	-	R	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
208	922510	S	+	-	-	-	DAMA	R	R	R	-	R	S	S	S	S	S	-	S	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

S no.	MRD	Initials	Age	Gender	AREA	DOA to hospital	DOD from hospital	Diagnosis	COMORBIDITY	Previous Hospitalization	DOA to ICU	DOD from ICU	ICU days	DOI OF CL	DOR OF CL	CL days	Indication of CL	CVC BLOOD	PER.LINE BLOOD	BLOOD CULTURE	CATHETER TIP
209	922611	B	63	M	NSICU	6/20/2020	6/26/2020	Hepatic encephalopathy	DM	-	6/20/2020	6/25/2020	4	6/20/2020	6/25/2020	5	TPN	+	-	+	-
210	911711	V	66	M	MICU	6/21/2020	6/25/2020	Gall stones	-	-	6/23/2020	6/24/2020	8	6/23/2020	6/24/2020	1	TPN	+	+	+	-
211	922692	N	62	F	MICU	6/25/2020	7/10/2020	Altered sensorium	HTN	-	6/27/2020	7/5/2020	10	6/27/2020	7/4/2020	7	TPN	+	+	+	-
212	827286	R	35	M	SICU	6/28/2020	6/28/2020	RSA,BTA	DM HTN	-	6/28/2020	6/28/2020	22	-	-	-	-	+	+	+	-
213	810367	P	58	M	NSICU	6/28/2020	7/18/2020	RSA,BTA	-	-	6/28/2020	7/10/2020	7	-	-	-	-	-	+	+	-
214	922935	D	50	M	NSICU	6/1/2020	6/20/2020	Flame burns	-	-	6/1/2020	6/15/2020	15	-	-	-	-	-	+	+	-
215	400217	A	31	M	MICU	6/1/2020	6/10/2020	AFI	-	+	6/5/2020	6/8/2020	6	6/5/2020	6/8/2020	3	TPN	+	+	+	-
216	922960	R	75	M	MICU	6/6/2020	6/26/2020	RSA,SDH	HTN	-	6/6/2020	6/16/2020	19	-	-	-	-	-	+	+	-
217	919379	M	53	M	TICU	6/9/2020	6/15/2020	ALD,Pl.effusion	DM	+	6/10/2020	6/12/2020	36	6/10/2020	6/12/2020	2	TPN	+	+	+	-
218	268515	K	57	F	TICU	6/15/2020	6/25/2020	ALD	-	+	6/20/2020	6/24/2020	23	6/20/2020	6/24/2020	4	TPN	+	-	+	-
219	886543	P	57	F	SICU	6/20/2020	6/28/2020	UTI,encephalothy	DM	-	6/20/2020	6/25/2020	4	-	-	-	-	-	+	+	-
220	923219	N	52	F	SICU	6/21/2020	6/25/2020	Acute cystitis	-	+	6/22/2020	6/24/2020	38	6/22/2020	6/24/2020	2	TPN	+	+	+	-
221	923211	R	40	M	PCCU	6/22/2020	7/15/2020	Rt.MCA infarct	DM HTN	-	6/22/2020	7/10/2020	28	6/22/2020	7/30/2020	8	TPN	+	+	+	-
222	922326	S	58	M	NSICU	6/15/2020	6/25/2020	Electric burns	-	-	6/16/2020	6/24/2020	15	-	-	-	-	-	+	+	-
223	898946	K	60	M	STICU	6/22/2020	7/15/2020	Rt.MCA infarct	HTN	-	6/23/2020	7/10/2020	40	6/23/2020	7/5/2020	12	TPN	+	-	+	-
224	923364	G	53	M	MICU	7/20/2020	7/30/2020	Lt.MCA infarct	HTN	-	7/22/2020	7/28/2020	22	-	-	-	-	-	+	+	-
225	939363	S	62	F	PCCU	7/5/2020	7/15/2020	Diabetic foot	DM HTN	-	7/7/2020	7/10/2020	4	7/7/2020	7/10/2020	3	TPN	+	-	+	-
226	937081	G	56	F	MICU	6/20/2020	7/3/2020	Limb amputation	DM	-	6/25/2020	6/30/2020	6	6/25/2020	6/30/2020	5	TPN	+	-	+	-
227	940295	N	82	M	STICU	7/1/2020	7/10/2020	Alc.induced pancreatitis	DM HTN	+	7/4/2020	7/8/2020	5	-	-	-	-	-	+	+	-
228	940351	I	55	M	PCCU	7/1/2020	7/20/2020	RSA,HI	DM	-	7/1/2020	7/15/2020	16	7/1/2020	7/10/2020	10	TPN	+	-	+	+
229	940765	S	48	M	SICU	7/5/2020	7/15/2020	RSA	-	-	7/5/2020	7/15/2020	11	-	-	-	-	-	+	+	-
230	587944	N	36	F	PCCU	7/5/2020	7/15/2020	P/O/C/O necrosectomy	-	+	7/17/2020	7/20/2020	4	-	-	-	-	-	+	+	-
231	941758	V	37	F	STICU	7/5/2020	7/15/2020	AFI,TCP,shock	-	-	7/6/2020	7/13/2020	7	-	-	-	-	-	+	+	-
232	942422	V	52	M	SICU	7/13/2020	7/20/2020	AFI, pulm.koch's	DM	-	7/14/2020	7/19/2020	5	-	-	-	-	-	+	+	-
233	940958	A	50	M	NSICU	7/10/2020	7/20/2020	Acute cholecystitis	-	-	7/13/2020	7/17/2020	4	7/13/2020	7/18/2020	5	TPN	+	+	+	-
234	941158	N	60	F	PCCU	7/10/2020	7/20/2020	Thyroid swelling	DM HTN	-	7/12/2020	7/18/2020	6	7/12/2020	7/19/2020	7	TPN	+	+	+	-
235	932579	S	67	F	NSICU	7/10/2020	7/20/2020	Acute gastroenteritis,shock	DM	+	7/12/2020	7/17/2020	5	7/12/2020	7/18/2020	6	TPN	+	+	+	-
236	934691	B	51	M	PCCU	7/5/2020	7/15/2020	AFI,TCP,shock	HTN	-	7/5/2020	7/14/2020	9	-	-	-	-	-	+	+	-
237	941160	P	32	M	NSICU	7/15/2020	7/25/2020	ALD,hepatic encephalopathy	-	-	7/16/2020	7/21/2020	5	-	-	-	-	-	+	+	-
238	938831	H	41	F	STICU	7/6/2020	7/18/2020	ALD	HTN	-	7/6/2020	7/15/2020	9	7/5/2020	7/16/2020	11	TPN	+	+	+	-
239	942200	P	45	M	MICU	7/17/2020	7/28/2020	Cervical spondylitis	-	-	7/20/2020	7/25/2020	5	7/21/2020	7/24/2020	3	TPN	+	+	+	-
240	945391	M	23	M	PCCU	7/17/2020	7/30/2020	Pneumonitis	HTN	-	7/18/2020	7/28/2020	10	7/17/2020	7/25/2020	8	TPN	+	+	+	-
241	944168	K	21	M	SICU	7/21/2020	7/29/2020	Bact.pneumonia	-	+	7/25/2020	7/28/2020	3	-	-	-	-	-	+	+	-
242	869199	A	50	F	SICU	7/20/2020	7/30/2020	Acute pancreatitis	-	-	7/20/2020	7/28/2020	8	7/22/2020	7/25/2020	5	TPN	+	-	+	-
243	946575	Y	37	M	PCCU	7/20/2020	7/30/2020	Fall from height	-	-	7/20/2020	7/27/2020	7	-	-	-	-	-	+	+	-
244	899774	S	79	F	MICU	7/25/2020	7/5/2020	Cholecystitis	DM HTN	-	6/29/2020	7/4/2020	5	7/28/2020	7/5/2020	7	TPN	+	+	+	-
245	938736	M	52	M	SICU	6/28/2020	7/6/2020	Peptic ulcer	DM	-	6/30/2020	7/5/2020	6	-	-	-	-	-	+	+	-
246	939655	H	39	M	MICU	6/28/2020	7/5/2020	ALD	-	-	6/30/2020	7/5/2020	5	7/1/2020	7/4/2020	3	TPN	+	+	+	-
247	940099	N	35	M	MICU	6/29/2020	7/7/2020	BTA,Intestinal perforation	-	-	7/1/2020	7/5/2020	4	7/1/2020	7/4/2020	4	CVP monitoring	+	+	+	-
248	939104	A	28	M	SICU	7/1/2020	7/15/2020	RSA,BTA	-	-	7/1/2020	7/14/2020	14	-	-	-	-	-	+	+	-
249	938213	G	20	M	SICU	7/1/2020	7/10/2020	Fall from height	-	+	7/1/2020	7/8/2020	7	-	-	-	-	-	+	+	-
250	940019	S	34	F	MICU	7/2/2020	7/15/2020	Fall from height,HI	-	-	7/4/2020	7/8/2020	4	-	-	-	-	-	+	+	-
251	938163	J	48	M	MICU	7/1/2020	7/10/2020	ALD	DM	-	7/1/2020	7/6/2020	5	7/2/2020	7/7/2020	5	CVP monitoring	+	+	+	-
252	940247	S	43	F	MICU	7/1/2020	7/12/2020	COPD	HTN	-	7/3/2020	7/10/2020	7	-	-	-	-	-	+	+	-

S no.	MRD	Initials	DATE OF COLLECTION	LAB ID	GRAM STAIN	TTP (HOURS)	TTP GROUP	ORGANISM	Time to BSI	CLABSI	TLC	fever	HR	RR	CRP	PCT	SOURCE OF INFECTION	MDR	XDR	PDR	MRSA	VRE	PROBABLE ESBL	CONFIRMED ESBL
209	922611	B	6/20/2020	7742	GNCB	16	2	Acinetobacter baumannii	10	NO	8.5	-	66	20	-	1.5	ET-Acineto.baumm.	+	+	-	-	-	+	-
210	911711	V	6/21/2020	7789(P),7790©	GNB	C-11,P-15	2	Enterobacter cloacae	9	NO	10.8	-	86	20	-	0.3	-	+	-	-	-	-	-	-
211	922692	N	6/25/2020	7066©,7067(P)	GNB	C-14,P-17.5	2	Enterobacter cloacae	8	NO	8.9	-	76	18	-	4.5	-	+	-	-	-	-	-	-
212	827286	R	6/28/2020	7137©,7138(P)	GNB	C-22,P-27	3	Klebsiella pneumoniae	15	NO	15.9	-	88	16	-	9.6	Urine Klebsiella	+	+	-	-	-	+	+
213	810367	P	6/28/2020	6963	GPC	12.5	2	Staphylococcus epidermidis	20	NO	20.6	-	98	16	-	100	-	+	-	-	-	-	-	-
214	922935	D	6/1/2020	6884	GNB	8	1	Klebsiella pneumoniae	24	NO	5.6	+	92	17	-	1.5	-	+	-	-	-	-	+	-
215	400217	A	6/1/2020	6303(P),6304©	GNCB	C-13,P-17.5	2	Acinetobacter baumannii	17	NO	6.7	-	74	19	-	5.5	-	+	-	-	-	-	-	-
216	922960	R	6/6/2020	7158	BYLC	19	2	Candida tropicalis	16	NO	18.9	-	70	20	-	2.5	Urine-C.tropcialis	-	-	-	-	-	-	-
217	919379	M	6/9/2020	7857(P),7863©	GNCB	C-27,P-36	3	Acinetobacter baumannii	10	NO	5.5	+	72	22	-	0.3	-	+	+	-	-	-	-	-
218	268515	K	6/15/2020	7614	GNB	21	2	Klebsiella pneumoniae	9	NO	16.5	-	96	24	-	3.77	Urine/ET-Klebsiella	+	+	-	-	-	+	-
219	886543	P	6/20/2020	6500	GNCB	13	2	Acinetobacter baumannii	8	NO	10.9	-	100	18	-	100	-	+	-	-	-	-	+	+
220	923219	N	6/21/2020	6794	GNB	C-11,P-16	2	Acinetobacter baumannii	35	NO	4.5	-	75	20	-	0.54	EVD tip/soft ts/Wound swab-Acinetobacter baumannii	+	+	-	-	-	+	-
221	923211	R	6/22/2020	6799	GPC	C-23,P-27	3	Enterococcus faecium	46	NO	18.9	-	70	20	-	0.91	ET-Pseudomonas	+	+	-	-	-	-	-
222	922326	S	6/15/2020	6567	GNB	23	2	Stenotrophomonas maltophilia	11	NO	8.9	+	72	20	-	0.67	-	-	-	-	-	-	-	-
223	898946	K	6/22/2020	7814	GNB	8.5	1	Klebsiella pneumoniae	20	NO	16.7	+	88	18	-	42.5	-	+	-	-	-	-	-	-
224	923364	G	7/20/2020	8500	GNB	14.5	2	Pseudomonas aeruginosa	23	NO	7.2	+	55	16	-	0.5	-	+	-	-	-	-	+	-
225	939363	S	7/10/2020	9448	GNB	18	2	E.coli	10	NO	7.8	-	70	16	-	0.54	Drain fl/Tissue-E.coli	+	+	-	-	-	+	+
226	937081	G	6/24/2020	9040	GNB	12	1	E.coli	9	NO	8.6	-	80	19	-	35.22	ET/Wound swab-E.coli	+	+	-	-	-	+	+
227	940295	N	7/4/2020	9470	GNCB	17	2	Acinetobacter baumannii	8	NO	9.8	-	75	17	-	-	ET-Acineto.baum	+	-	-	-	-	+	-
228	940351	I	7/7/2020	9565©,9566(P)	GNB	P-15,C-21	2	Klebsiella pneumoniae	15	NO	8.7	-	88	16	-	2.58	-	+	-	-	-	-	-	-
229	940765	S	7/8/2020	9609	BYLC	6.5	1	Candida famata	24	NO	16.5	+	92	20	-	100	ET-Candida	-	-	-	-	-	-	-
230	587944	N	7/9/2020	9655	GNB	27	3	Klebsiella pneumoniae	10	NO	4.5	-	100	22	-	0.5	Drain fl-Klebsiella	+	+	-	-	-	+	+
231	941758	V	7/10/2020	9683	GPC	19	2	Staphylococcus hominis	9	NO	8.5	-	72	15	-	1.8	-	+	-	-	-	-	-	-
232	942422	V	7/13/2020	9828	GNB	13.5	2	E.coli	8	NO	7.3	-	70	20	-	-	ET-E.coli	+	+	-	-	-	+	+
233	940958	A	7/16/2020	9785(P)/9786©	GNCB	P-13,C-18	2	Acinetobacter baumannii	15	NO	6.5	-	20	21	-	100	ET-Acineto.baum	+	+	-	-	-	+	-
234	941158	N	7/15/2020	9890	GPC	C-9,P-12	1	Staphylococcus haemolyticus	17	NO	11.5	-	76	22	-	1.5	ET-Staphylococcus	-	-	-	-	-	-	-
235	932579	S	7/15/2020	9894C, 9895P	GNB	C-11.5, P-13	2	Klebsiella pneumoniae	20	NO	6.6	-	68	19	-	30	Urine-Klebsiella pneumoniae	+	-	-	-	-	-	-
236	934691	B	7/6/2020	9515	GNB	15	2	Pseudomonas stutzeri	9	NO	14.5	-	72	17	-	0.5	-	-	-	-	-	-	-	-
237	941160	P	7/18/2020	10007	GNCB	8.5	1	Acinetobacter baumannii	10	NO	10.2	+	70	18	-	-	-	+	+	-	-	-	+	-
238	938831	H	8/7/2020	10766©,10768(P)	BYLC	P-14,C-20	2	Candida famata	23	NO	7.5	-	84	20	-	35	-	-	-	-	-	-	-	-
239	942200	P	7/22/2020	10189©,10190(P)	GNCB	P-8,C-11	1	Acinetobacter baumannii	14	NO	8.6	-	110	21	-	1.5	ET-Acineto.baumm.	+	+	-	-	-	-	-
240	945391	M	7/23/2020	10212©,10213(P)	GNB	C-17,P-24	2	Klebsiella pneumoniae	12	NO	12.5	-	65	19	-	-	-	+	+	-	-	-	+	-
241	944168	K	7/25/2020	10298	GNB	14	2	Klebsiella pneumoniae	25	NO	9.7	+	72	20	+	40.5	BAL-Klebsiella	+	+	-	-	-	+	-
242	869199	A	7/23/2020	10665	GNB	15	2	Klebsiella pneumoniae	20	NO	7.5	+	70	21	-	1.7	ET-Klebsiella	+	-	-	-	-	-	-
243	946575	Y	7/29/2020	10500	GNCB	22	2	Acinetobacter baumannii	15	NO	8.8	-	68	24	-	0.9	ET/Oral secrn-Acineto.baum.	+	+	-	-	-	-	-
244	899774	S	6/30/2020	9278	GNB	P-28,C-33	3	Klebsiella pneumoniae	11	NO	11.7	-	72	20	-	1.5	Urine-Klebsiella	+	-	-	-	-	-	-
245	938736	M	7/1/2020	9291	GPC	35	3	Staphylococcus epidermidis	30	NO	15.6	-	74	18	-	0.5	-	-	-	-	-	-	-	-
246	939655	H	7/2/2020	9345©,9346(P)	GNB	P-12,C-15.5	2	Sphingomonas paucimobilis	14	NO	6.7	-	88	16	-	3.5	-	+	+	-	-	-	+	-
247	940099	N	7/4/2020	9336©,9337(P)	GNB	C-17,P-25	3	Salmonella typhi	9	NO	10.5	-	80	16	-	10	-	-	-	-	-	-	-	-
248	939104	A	7/4/2020	9164©	GPC	26	3	Staphylococcus aureus	10	NO	11.5	+	70	19	-	57.11	-	-	-	-	+	-	-	-
249	938213	G	7/4/2020	9443	GNB	19	2	E.coli	23	NO	7.7	-	84	20	-	10	-	+	+	-	-	-	+	-
250	940019	S	7/4/2020	9404	GPC	21	2	Staphylococcus haemolyticus	22	NO	9.8	-	72	22	-	4.4	-	-	-	-	-	-	-	-
251	938163	J	7/4/2020	9237(P),9238©	GPC	C-27,P-36	3	Staphylococcus hominis	10	NO	12.6	-	76	22	-	6.5	-	-	-	-	-	-	-	-
252	940247	S	7/4/2020	9441	GPC	20	2	Staphylococcus haemolyticus	25	NO	10.5	+	84	18	-	-	-	+	-	-	-	-	-	-

S no.	MRD	Initials	PROBABLE AmpC	CONFIRMED AmpC	PROBABLE MBL	CONFIRMED MBL	OUTCOME	AMP	P/T	CXM	CAZ	CTR	CFPZ+SB	CPM	ERT	IM	MM	DOR	AK	GEN	AMC	CIP	LEVO	TET	MIN	TGC	CX	COTRI	CX SCREEN	P	OXA	HLG	CD	ERY	LZD	VA	RA	TEICO	DAPTO	FLUCON	FLUCYT	AMP B	CASPO	VORI
209	922611	B	-	-	-	-	DAMA	R	R	-	R	R	R	R	-	R	R	-	S	R	R	R	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
210	911711	V	-	-	-	-	RECOVERED	S	S	-	R	S	S	S	-	S	R	R	S	S	R	S	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
211	922692	N	-	-	-	-	DAMA	R	S	-	R	R	S	R	-	S	S	R	S	R	R	R	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
212	827286	R	-	-	+	-	RECOVERED	-	S	R	-	R	R	R	R	R	R	-	R	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
213	810367	P	-	-	-	-	Expired	-	-	-	-	-	-	-	-	-	-	-	-	R	-	R	R	R	-	-	-	R	-	R	S	R	-	R	S	R	-	S	R	-	-	-	-	-
214	922935	D	-	-	-	-	RECOVERED	-	R	R	-	R	R	R	R	R	R	-	R	R	R	S	-	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
215	400217	A	+	-	+	-	Expired	R	R	-	R	R	R	R	-	R	R	-	R	R	R	R	R	-	S	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
216	922960	R	-	-	-	-	DAMA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
217	919379	M	+	+	+	-	RECOVERED	R	R	-	R	R	R	R	-	R	R	-	R	R	R	R	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
218	268515	K	-	-	+	+	Expired	-	R	R	-	R	R	R	R	R	R	-	R	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
219	886543	P	+	+	+	-	Expired	R	R	-	R	R	R	R	-	R	R	-	R	R	R	R	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
220	923219	N	-	-	-	-	RECOVERED	R	R	-	R	R	R	R	-	R	R	-	R	R	R	R	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
221	923211	R	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	R	-	R	R	R	-	-	-	R	-	R	-	-	R	-	-	-	-	-	-	-	-	-	-
222	922326	S	-	-	-	-	RECOVERED	R	R	-	R	R	R	S	-	R	R	R	R	S	R	S	S	-	R	S	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
223	898946	K	-	-	+	-	Expired	-	R	R	-	R	R	R	R	R	R	-	S	S	R	R	-	-	-	S	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
224	923364	G	-	-	+	-	RECOVERED	R	S	-	R	R	R	R	-	R	R	R	S	S	R	R	R	-	S	S	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
225	939363	S	-	-	+	+	RECOVERED	R	R	-	-	R	R	R	R	R	R	-	S	S	R	R	-	-	-	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
226	937081	G	-	-	-	-	RECOVERED	R	S	R	-	R	R	R	R	R	R	-	S	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
227	940295	N	-	-	+	-	DAMA	R	R	-	R	R	R	R	-	R	R	-	S	R	R	R	R	-	R	S	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
228	940351	I	-	-	-	-	RECOVERED	-	R	R	-	R	R	R	S	S	S	-	R	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
229	940765	S	-	-	-	-	DAMA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	R	S	S	S	S
230	587944	N	-	-	+	-	DAMA	-	R	R	-	R	R	R	R	R	R	-	R	R	R	R	-	-	-	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
231	941758	V	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	S	-	R	R	S	-	-	-	R	-	R	S	-	S	R	R	R	S	R	S	-	-	-	-	-
232	942422	V	+	+	+	-	RECOVERED	R	S	R	-	R	R	R	R	R	R	-	R	S	R	R	-	-	-	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
233	940958	A	+	-	-	-	DAMA	R	R	-	R	R	R	R	-	R	R	-	S	R	R	R	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
234	941158	N	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	R	S	-	-	-	R	-	R	S	R	S	S	S	S	S	S	S	-	-	-	-	-
235	932579	S	-	-	-	-	Expired	-	R	R	-	R	R	R	R	R	R	-	S	S	S	R	-	-	-	-	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
236	934691	B	-	-	-	-	RECOVERED	R	R	-	S	R	S	S	-	R	R	S	S	S	S	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
237	941160	P	-	-	+	-	DAMA	S	R	-	R	R	R	R	-	R	R	-	R	R	R	R	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
238	938831	H	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	S	S	S	S	S
239	942200	P	+	-	-	-	DAMA	R	R	-	R	R	R	R	-	R	R	-	R	R	R	R	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
240	945391	M	-	-	+	-	RECOVERED	-	R	R	-	R	R	R	R	R	R	-	R	R	R	R	-	-	-	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
241	944168	K	+	+	+	-	RECOVERED	-	R	R	-	R	R	R	R	R	R	-	R	R	R	R	-	-	-	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
242	869199	A	+	-	-	-	Expired	-	S	R	-	R	S	S	S	S	S	-	S	S	R	S	-	-	-	S	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
243	946575	Y	-	-	-	-	Expired	R	R	-	R	R	R	R	-	R	R	-	R	R	R	R	R	-	R	S	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
244	899774	S	-	-	-	-	RECOVERED	-	R	S	-	R	R	R	R	S	S	-	R	R	S	S	S	-	-	S	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
245	938736	M	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	R	-	R	R	S	-	-	-	R	-	R	S	-	R	R	S	S	S	S	S	-	-	-	-	-
246	939655	H	-	-	+	-	DAMA	R	R	-	R	R	R	R	-	R	R	R	R	R	R	R	R	-	R	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
247	940099	N	-	-	-	-	RECOVERED	S	-	-	-	-	-	-	-	-	-	-	-	-	-	R	R	-	-	-	-	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
248	939104	A	-	-	-	-	DAMA	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	R	S	-	-	-	R	+	R	R	-	R	R	S	S	R	S	S	-	-	-	-	-
249	938213	G	-	-	+	-	RECOVERED	R	R	R	-	R	R	R	R	R	R	-	S	R	R	R	-	-	-	R	-	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
250	940019	S	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	S	S	-	-	-	S	-	R	S	-	S	S	S	S	S	S	S	-	-	-	-	-
251	938163	J	-	-	-	-	DAMA	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	R	S	-	-	-	R	-	R	S	-	S	S	S	S	S	R	-	-	-	-	-
252	940247	S	-	-	-	-	RECOVERED	-	-	-	-	-	-	-	-	-	-	-	-	S	-	R	R	R	-	-	-	S	+	R	S	-	R	R	S	R	R	S	S	-	-	-	-	-

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The Principal,
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Subject: **Approval of Plan of Thesis.**

This is to inform you that the Faculty of Medical Sciences in its meeting held on 29.05.2019 has approved the plan of thesis of **Shivani Gupta**, a student of your college for **MD Microbiology** along with the names of Supervisor/Co-Supervisor as under:-

Topic Plan of Thesis

Blood stream infections in ICUs and their association with central venous catheters

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The student has to submit the four copies of thesis (along with PDF format) , to the Controller of Examinations, BFUHS, Faridkot, at least six months before the commencement of theory examination, if he/she is otherwise eligible to take the examination. He /She must directed to attach a photocopy of this letter with the forwarding letter while submitting thesis to the University along with the letter of approval of University for change of supervisor/Co-Supervisor, change of topic,(if any).

Dr. S P Singh MS(Oph)
Controller of Examinations

Note :

1. *If any discrepancy found regarding topic of thesis or Supervisor/Co-Supervisor, inform undersigned within one month after issue of this letter.*
2. *The student may submit the thesis as per the schedule already conveyed i.e for May/June examination 30th Nov of the preceding the year of examination and for Nov/Dec examinations 31st May of the year of examination.*

BLOOD STREAM INFECTIONS IN ICUs AND THEIR ASSOCIATION WITH CENTRAL VENOUS CATHETERS

THESIS PROPOSAL

FOR APPROVAL OF SUBJECT OF THESIS TO BE SUBMITTED IN

PARTIAL FULFILMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

MD

In

MICROBIOLOGY

OF THE

BABA FARID UNIVERSITY OF HEALTH SCIENCES

FARIDKOT

DECEMBER, 2018

DR. SHIVANI GUPTA

DEPARTMENT OF MICROBIOLOGY
DAYANAND MEDICAL COLLEGE AND HOSPITAL
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ABSTRACT OF PLAN OF THESIS

Title	Blood Stream Infections in ICUs and their association with central venous catheters
For the degree of	MD (Microbiology)
Name of the candidate	Dr. Shivani Gupta
Supervisor	Dr. Deepinder K. Chhina, Professor and Head Department of Microbiology, DMCH, Ludhiana
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Institution	Dayanand Medical College and Hospital, Ludhiana
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Introduction: Blood stream infections are an important cause of morbidity and mortality especially in patients admitted in the Intensive Care Units (ICUs). A Central Line-Associated Blood Stream Infection (CLABSI) is defined as a laboratory-confirmed bloodstream infection not related to an infection at another site that develops within 48 hours of a central line placement. Blood stream infections are important and deadly hospital acquired infections (HAIs), with reported mortality of 12%–25%.The antimicrobial therapy is initiated empirically before the results of blood culture and antimicrobial susceptibility pattern of the isolates are available which results in poor outcome. So proper measures should be taken to reduce blood stream infections as per guidelines and appropriate antimicrobial therapy should be started after the lab confirmed results.

Aim of study:

- To identify the bacterial isolates from blood samples and characterize them on the basis of Antimicrobial susceptibility testing.
- To study association of blood stream infections with central venous catheters and other risk factors.

Materials and Methods: The prospective study will be conducted in department of Microbiology in Dayanand Medical college and Hospital, Ludhiana for a period of 1 year. Blood samples collected from patients admitted in ICUs will be processed as per standard protocol and culture positive cases will be included in the study.

Clinical significance: BSI is potentially life threatening condition. If BSI is clinically suspected, clinicians should start empiric therapy based on underlying disease, patient age, infecting pathogen and site of infection and than escalation, de-escalation of antibiotics should be done depending on blood culture reports.

Keywords: BSI: Blood Stream Infections; ICUs=Intensive Care Units ; HAIs : Hospital Acquired Infections.

(Signature) Candidate	(Signature) Co-supervisor	(Signature) Co-supervisor	(Signature) Supervisor	(Signature) Principal

CERTIFICATE OF FACILITIES AVAILABLE

This is to certify that the facilities for work on the subject of thesis titled " **Blood Stream Infections in ICUs and their association with central venous catheters**" exist in the Department of Microbiology, DMC&H, Ludhiana and will be provided to the candidate. We will see that the data being included in the thesis is genuine and is collected by the candidate herself under our supervision and guidance.

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APPROVAL PROFORMA
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Likely date of appearing in PG examination	May 2021
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5. Dean Academics	5. HOD Medicine
6. Vice Principal	6. HOD Surgery
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3	COURSE OF STUDY AND SUBJECT	MD Microbiology
4	DATE OF ADMISSION OF COURSE	10 MAY 2018
*	TITLE OF THE TOPIC	BLOOD STREAM INFECTIONS IN ICUS AND THEIR ASSOCIATION WITH CENTRAL VENOUS CATHETERS

6. BRIEF RESUME OF THE INTENDED WORK

6.1 NEED FOR STUDY

BSI is a leading, preventable infectious complication in critically ill patients and has a negative impact on patient's outcome[1] BSI is an important cause of morbidity and mortality worldwide[2], which is more common in the intensive care units.[3] As a preventable healthcare-associated infection, they are associated with significant morbidity and excess costs to the healthcare system. Effective and long-term BSI prevention requires a multifaceted approach.[4]

Microorganisms present in the circulating blood whether continuously or intermittently are threat to every organ in the body. Approx 2 lac cases of bacteraemia occur annually with mortality rates ranging from 20 to 50% worldwide.[5] Therefore early diagnosis and appropriate treatment of these infections can make the difference between life and death.

BSI is more common in patients who are immunocompromised, develop multiorgan dysfunction, require mechanical ventilation or renal replacement therapy, and have severe illness on ICU admission.[6,7]

A definitive diagnosis of CRBSI requires that the same organism grow from at least 1 percutaneous blood culture and from a culture of the catheter tip, or that 2 blood samples be drawn (one from a catheter vein and the other from a peripheral vein) that, when cultured, meet CRBSI criteria for quantitative blood cultures or differential time to positivity (DTP).[8]

BSI are common and potentially lethal. The magnitude of the potential for central venous catheters (CVCs) to cause morbidity and mortality resulting from infectious complications has been estimated in several studies.[9] CLABSI is associated with an increase in total hospital cost, increase in hospital length of stay.[10] The majority of serious catheter related infections are associated with CVCs especially those that are placed in patients in ICUs as in the ICU, central venous access are needed for extended period of time, patients are colonized with hospital acquired organisms and the catheter is manipulated multiple times per day for the administration of fluids, drugs and blood products. Moreover, some catheters can be inserted in urgent situations during which optimal attention to aseptic technique might not be feasible.[11]

CVCs cause more sepsis than peripheral venous catheters. Local inflammatory signs at the catheter's portal of entry or tunnel have a highly predictive value for infection but its absence has a very poor negative value. As the local signs may be completely absent, the clinical diagnosis of CLABSI may be difficult. Therefore, microbiological techniques are necessary to identify CLABSI. When present, two sets of blood cultures should be obtained. With the greater use of central line this problem is likely to increase.[12]

The Care Bundle Model was initiated by the institute of Healthcare Improvement (IHI), and is recognized as improving patient safety outcomes by preventing the possibility of infections and therefore reducing mortality and morbidity because of CLABSI among ICU patients. The CL bundle is a group of

evidence-based interventions applied for patients with CLs which has shown sustained improvements over time. These interventions are documented to lead to better outcomes when they are implemented together than when they are implemented individually. The components of the CL bundle are: 1) hand hygiene 2) maximal barrier precautions 3) chlorhexidine skin antisepsis 4) optimal catheter site selection and finally 5) daily review of the necessity for the CL.[13]

In developing countries, use of antibiotic is usually irrational. Since there is no universal diagnostic marker, and also because of poor investigation facilities, physicians prescribe antibiotic on clinical suspicion. Many of them are broad spectrum blanket antibiotic as the organism and sensitivity pattern are mostly unknown. Indeed, because invasion of the bloodstream represents one of the most important sequelae of infection, blood cultures have become critically important and frequently performed tests in clinical microbiology laboratories. Culturing blood samples to reveal the presence of microorganisms is a highly specific indicator of bloodstream infections and the results of antimicrobial susceptibility testing may assist in the choice of appropriate antimicrobial therapy for such patients.[14]

Therefore, this study will be done to know the Blood stream infections in ICUs and their association with central venous catheters.

6.2 REVIEW OF LITERATURE

BSI is one of the leading causes of death due to nosocomial events in the ICU. Immune depression and invasive health care procedures together create a high risk environment for nosocomial BSI in critically ill patients. Because nosocomial BSI can be used as an indicator of quality of care in ICUs, determining the exact impact of BSIs on the outcome of patients is considered important.[15]

Blood is the main transport mechanism connecting different parts of the body. Blood has no normal flora and the presence of microorganisms in it indicates failure of the defence mechanisms to maintain its sterility. In many cases, such a failure is temporary and of no clinical importance but in others, it leads to serious blood stream infections which is more common in patients admitted in ICUs.

Various studies has been done worldwide to study the blood stream infections and their association with central venous catheters.

During a study by Gnass *et al*, 2525 patients were admitted to the ICU. The number of CVC related BSIs, was 2.7 per 1000 CVC days. Microorganisms isolated included methicillin susceptible *Staphylococcus aureus* (n=6), methicillin resistant *S.aureus*(n=2), coagulase negative methicillin resistant *Staphylococcus* (n=2),*Escherichia coli*(n=1), *Klebsiella pneumoniae*(n=1) and *Enterobacter cloacae*(n=1).[16]

The total prevalence of nosocomial primary blood stream infections was 0.3%, 8.3% of all nosocomial infections recorded were primary bloodstream infections. The device utilization rate was 27.3% for peripheral and 6.1% for central catheters with higher rates in West Germany. The associated incidence density of primary nosocomial bloodstreams infections per 1000 catheter days was 0.3 for peripheral and 0.8 for central lines. In 61.4%, the primary bloodstream infections were microbiologically confirmed. In 52.6% of cases,Gram positive bacteria were isolated (*Staphylococcus aureus*:15.8%,other coagulase negative *Staphlococcus* species: 34.2%) and in 47.4%, Gram-negative bacteria (*Escherichia coli: 13.2% and Klebsiella species:10.5%).*[17]

During a 6 month study conducted by Chen *et al.* a total of 281 patients who underwent central venous catheterization after general surgery were enrolled. The mean duration from CVC insertion to the development of infection was 7.12 days. The rate of blood stream infection without isolation of the same organism from the catheter was 1.4% (4/281). The rate of CVC bacteremia, defined as positive culture from a central line sample in a patient without signs of infection,was 8.5%(24/281). The incidence of CLABSI was 7.5/1000 central venous lines days.[18]

Li *et al* reported that among 67 patients diagnosed as CLABSI, 24 cases (35.8%) died while 43 survived. A total of 81 strains were detected, including 42 Gram –positive bacteria (51.9%), 36 Gram-negative bacteria (44.4%) and 3 fungi (3.7%). The predominant pathogenic Gram positive and

Gram negative bacteria were *Staphylococcus epidermidis* and *Acinetobacter baumannii* respectively. [19]

A case control study was done at GMCH, Chandigarh which included 115 patients with CVC in situ. The result showed that in 25/115 patients, definite diagnosis of CVC-BSI was made. Local signs of infection (erythema, tenderness and oozing) were found more significantly in CVC-BSI cases. *Staphylococcus aureus* followed by *Pseudomonas aeruginosa* and non-*albicans Candida* were common CVC-BSI pathogens. Multidrug-resistant (MDR) strains were isolated in bacterial agents of CVC-BSI. The incidence of CVC-BSI was 21.73% and the rate was 14.59 per 1000 catheter days. Prolonged ICU stay and longer catheterization were major risk factors. [20]

A study was made in Safdarjang hospital, New Delhi between January 2012 and December 2014. A total of 434 samples were received in the laboratory from patients with a clinical diagnosis of sepsis after central venous catheter.Two hundred and fifty six catheter tips (59%) were colonized. *Staphylococcus aureus* (42%) was the most common colonizer followed by the *Enterobacteriaceae* family, gram negative non-fermenters and *Candida albicans*. Thirty-three CLABSIs were identified, giving a CLABSI rate of 9.5 per 1000 catheter days. *S. aureus* was the major cause (63%) of CLABSI followed by *Acinetobacter baumannii, Pseudomonas aeruginosa, Klebsiella pneumoniae* and *Escherichia coli*. Methicillin resistant *S. aureus* accounted for 76% of *S. aureus* CLABSIs. All *A. baumannii* and 33% of *P. aeruginosa* isolates were multi-drug resistant

(MDR). All *E. coli* and *K. pneumoniae* were extended-spectrum β-lactamase (ESBL) producers, with 33% of *K. pneumoniae* being MDR.[21]

Other study done in the department of Microbiology, Bangalore Medical College and Research Institute, Karnataka, India which showed that the rate of CLABSI was 8.26/1000 central-line days and mostly affecting the age group 51-60 years and males were more commonly affected than females. *Staphylococci* were the most common organism isolated. The study showed high incidence of resistance against conventional antibiotics such as Ampicillin, Amoxycillin-clavulanate, Gentamicin, Amikacin, Erythromycin and Azithromycin among the pathogens causing CLABSI.[22]

Based on these studies we have seen that *Staphylococcus* is the main organism isolated in cases of CLABSI and rate of CLABSI is higher in patients in ICUs and we will correlate these studies with our study which is to be done in patients admitted in ICUs of Dayanand Medical College and hospital, Ludhiana.

6.3 AIMS AND OBJECTIVES OF THE STUDY

- To identify the bacterial isolates from blood samples and characterize them on the basis of Antimicrobial susceptibility testing.
- To study association of blood stream infections with central venous catheters and other risk factors.

7. MATERIALS AND METHODS

The prospective study will be conducted in the department of Microbiology, Dayanand Medical College and Hospital, Ludhiana for a period of 1 year.

7.1 SOURCE OF DATA

- Blood samples/CVC tip from patients suspected of BSI admitted in ICUs.

7.2METHOD OF COLLECTION OF DATA

Inclusion criteria:

- All patients admitted in ICUs

Exclusion criteria:

- Patients admitted in wards.
- Patients less than 18 years of age.

SAMPLE COLLECTION:

Blood sample – Under all aseptic conditions, 10-20 ml of blood will be withdrawn from antecubital vein with a disposable syringe and will be inoculated directly into BACTEC 9240 or BacT/Alert culture bottles.

Central venous catheter tip –After disinfecting the skin around the catheter insertion site, the CVC will be removed and the proximal 5 cm segment will be cut with sterile blade and put in a sterile screw capped container. The samples will be transported immediately to the laboratory.

Sample processing: The samples received in the microbiology lab will be processed as per standard protocols. The blood culture bottles will be loaded

for a maximum period of 7 days or till the bottle flag positive by the system and time of positivity will be noted.

Processing of blood culture positive bottles:

- Smears will be prepared from the positive blood culture bottles and Gram staining of the smears will be done. Also the positive bottles will be sub cultured on blood agar and MacConkeys agar plates. The plates will be incubated at 37^0C for 18-24 hours.

Processing of central line tip:

- The central line tip will be inoculated on the blood Agar plate by Roll plate method.

Roll Plate Method (Maki et al)[23]

- A 5 cm central line tip will be transferred on to the surface of blood agar and rolled back and forth across the surface at least 4 times. The plate will be examined after overnight incubation at 37^0C.
- The presence of 15 or more colony forming units (CFUs) will be considered indicative of central line colonization.

Media used:

- Blood Agar: The medium will be prepared by adding 5-10% sterile animal (sheep) blood to sterile 2% nutrient agar (peptic digest of animal tissue, NaCl, beef extract) that will be melted and cooled to 50^0C.

- MacConkeys Agar

Peptone	20 g
Sodium taurocholate	5 g
Water	1 L
Agar	20g
Neutral red sol, 2% in 50% ethanol	3.5ml
Lactose,10% aqueous sol	100ml

The peptone and sodium taurocholate will be dissolved in the water by heating. The agar will be added and dissolved in the streamer or autoclave. pH will be adjusted to 7.5. Lactose and neutral red will be shaken, mixed and added. The medium will be heated in the autoclave with free steam (100^0C) for 1 hour, then at 115^0C for 15 min and will be poured in the plates.

Identification and characterization

Initial identification of organisms will be made on the basis of Gram staining and colony morphology. Final identification and characterization will be done by biochemical reactions/VITEK2 and Antimicrobial susceptibility testing of the isolates will be determined by Kirby bauer disc diffusion method/ VITEK2 system. The isolates will be grouped as MDR, XDR and PDR. Screening and confirmation for methicillin resistance in *Staphylococci*, vancomycin resistance in *Enterococci,* extended spectrum beta lactamase (ESBL), metallo beta lactamase (MBL) and AmpC production in Gram negative bacilli will be done.

Statistical analysis:

Data obtained will be analyzed using descriptive statistical methods.

7.3 DOES THE STUDY REQUIRE ANY INVESTIGATIONS OR INTERVENTIONS TO BE CONDUCTED ON PATIENTS OR OTHER HUMANS OR ANIMALS? IF SO, PLEASE DESCRIBE BRIEFLY.

Investigations like CBC, PCT, CRP, Blood culture.

7.4 HAS ETHICAL CLEARANCE BEEN OBTAINED FROM YOUR INSTITUTION IN CASE OF 7.3?

Yes attached herewith.

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PRESCRIPTION AUDIT

PROFORMA

MRD:

ADM NO:

PATIENT NAME:

AGE/GENDER :

DATE OF ADMISSION:

DATE OF DISCHARGE:

CONSULTANT:

DIAGNOSIS:

ICU :

Date of admission to the hospital:

Date of admission to the ICU:

Clinical presentation:

Clinical Diagnosis:

Any risk factor:

- Patients demographics
- Gender
- Comorbid conditions
- Prior hospitalization
- Prior surgeries
- Intubated
- Central line

In case of central line:

Indication of central line:

Signature of candidate

Signature of Supervisor

Date of Central line insertion:

Date of central line removal:

Total central line days:

Any other infection:

- Investigations Date Day
- TLC
- TEMPERATURE
- HEART RATE
- RESPIRATORY RATE
- CRP
- PCT

Microbiological Findings:

Date Sample/Lab no Microscopy Culture Antimicrobial Sensitivity

- Characterization:

  MRSA

  VRE

  ESBL

  MBL

- MDR/XDR/PDR:
- Antimicrobial therapy:
- Outcome:
- Any other relevant information:

Signature of candidate

Signature of Supervisor